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The Weir Report Foreshadowed.

SELDOM has even a Beama dinner proved so fruitful of material for thought and discussion as that which was held by the British Electrical and Allied Manufacturers' Association on Thursday last week. The speeches reached a high level of interest and significance, and covered a wide range of subjects.

The most notable pronouncement was no doubt that of Lord Weir of Eastwood, chairman of the Committee of Inquiry into the electrical situation appointed by the present Government, which presented its report to the Minister of Transport on May 20th, 1925. Lord Weir professed to forget the famous report, which is still kept secret, and to give his own personal opinions; but Lt.-Col. Wilfrid Ashley, responding to the toast, said that Lord Weir had laid bare "its minutest details," and whilst we must make allowance for the badinage of an after-dinner speech, it cannot be doubted that the main principles of the report will eventually be found to correspond closely with the substance of Lord Weir's "personal views." It is important, therefore, to examine his remarks with care.

To begin with, he emphasised the fact embodied in the first paragraph of our leader last week—that continued uncertainty as to the future policy of the Government was most unsettling, and highly detrimental to electrical development. No doubt, as the Minister of Transport assured his audience, the matter is receiving the daily attention of the Cabinet. No doubt, too, as he indicated, and as we surmised in the same leader, it is the question of finance that blocks the way; but whatever the reason, it cannot be too strongly urged that the hands of the Electricity Commissioners and of the electrical industry in general are paralysed by the sense of impending changes which prevails, and the impossibility of making rapid progress so long as the intentions of the Government remain unknown. As Lord Weir said, such conditions "breed lack of confidence, and irresolution, and they stultify progress." Unfortunately, it is no new thing: repeatedly in recent years the electrical industry has been subjected to a similar trial of its patience, and might say with Mercutio to Parliament: "A plague o' both your Houses!"

Returning to Lord Weir's speech, he said he was sure "that effective and efficient development of our national resources will be ruined if it becomes either a political issue or is studied from a narrow or parochial stand-

point." Here we have the two horns of the dilemma with which the electrical industry is confronted; indeed, it appears likely to be impaled upon both of them. The Electricity Commissioners complain that the existing undertakers will not surrender their parochialism, and, on the other hand—that which we have often anticipated in these columns with dread—there is only too great a danger that electricity supply will become the plaything of politicians. These are the two great dangers by which we are threatened. On the one hand some of the schemes of the Electricity Commissioners have already been wrecked on the rock of parochialism, and now we see the rest in danger of being sucked into the whirlpool of political machinations.

Naturally we welcome Lord Weir's emphatic declaration that we must look to electricity as the provider of motive power for industry; but no less cordially we approve of his denunciation of the illusion that British industry can be restored to unbounded prosperity by the adoption of electric power. As we have already pointed out, under existing conditions, with few exceptions, the cost of power forms but 3 or 4 per cent. of the cost of the finished product, and even if electricity were given free to manufacturers they could not appreciably reduce the selling price of their goods.

The real need of the moment is not to cheapen electric power—with all respects to Lord Weir it is already cheap—but to utilise it to far better purpose. That is to say, our manufacturers should adopt every available means of increasing the use of power in their works, by substituting power for manual labour in every process where it is possible, as has been done in the United States, with the result so often quoted that there the consumption of electricity per head of population is more than twice as great as in this country. This was the case when the report of the Ministry of Reconstruction was issued in 1918, and since that date the ratio has been increased.

Turning to the question of providing an ample supply of electricity, Lord Weir rightly rejects the idea of erecting giant power stations at the pit-heads in conjunction with plant for the low-temperature carbonisation of coal. The pit-head plant scheme has been with us for a quarter of a century, and has been repeatedly shown to be uneconomic, but we are glad to see that he is full of confidence as to the future pre-treatment of coal, and that he regards it as essential that any new electricity scheme shall be so devised as to enable coal pre-treatment to be dovetailed into it with facility when the time is ripe. We also welcome his statement that every effort must be made to utilise to the best advantage the enthusiasm, enterprise and energy which the great municipalities and power companies have hitherto displayed in developing the supply of electricity. The most contentious passage in his speech was that in which he declared that the standardisation of frequency must be carried out at the earliest possible moment, even if it involved a heavy outlay. There is much to be said on both sides of this thorny question. Apart from the merits of the subject, we are inclined to attach considerable weight to the cat which Col. Ashley let out of the bag in his reply, namely, that finance is vitally important, and it is not easy to see where the money is to come from to pay for such standardisation.

To sum up, Lord Weir advocates the generation of electricity from "waste heat," and the provision of "an open market" for it—which means a network of mains; the development of large existing undertakings; legislative facilities for the construction of transmission lines; and the standardisation of frequency. Hence he puts forward no new or revolutionary propositions; all these questions have been discussed, and the first two items are already recognised as sound practice (within reasonable limits—we do not regard the interlinking of distant power stations as reasonable). The demand for relief in the matter of wayleaves and regulations for overhead lines is insistent, and we hope we shall see it satisfied. The standardisation of frequency and the erection of interconnecting mains appear to be the items involving financial assistance from the State, and we cannot profess to be enthusiastic in support of either of them.

The Human Being in Industry.

The presence of the Prime Minister, the Minister of Labour, and a prominent member of the late Labour Government, at the dinner of the National Institute of Industrial Psychology on November 12th, taken in conjunction with the evident revival of interest in the "new spirit in industry" shown by numerous writers in *The Times* and other papers lately, is a gratifying indication that the human side of organised industry is once more attracting that attention which is its due.

It will be remembered that during the strenuous conditions and the scarcity of labour that prevailed during and immediately after the war, much attention was given to the question of co-operation between the two, or three, parties constituting the modern industrial machine. The several Whitley Reports, the Garton Foundation Memorandum, and the inauguration of movements in the direction of the organisation of brain workers, will be within the recollection of our readers.

While attention was given at that time to remuneration, hours, and conditions of labour, the last of these three terms was usually taken to mean the general policy and control of industry, or at least of industrial concerns. The question whether individual workers were comfortable or otherwise at their particular jobs was not yet prominent in the minds of those who were thinking about the matters involved. The study of the efficiency movement had made some progress, and process specifications, some of which caused more irritation than they were worth, had been prepared by many zealous and well-meaning persons.

It must have been, as we understand, about half-a-dozen years ago that a few people, realising that, while the whole is greater than its part, the whole is made up of its parts, came together and founded the National Institute of Industrial Psychology. They resolved to begin the study of mass problems by studying the individuals of whom the mass is composed. They understood (and it is, of course, obvious when attention is drawn to the fact) that it is not sufficient to see to it that Bill Jones works for eight hours only, and is remunerated for so doing at standard rates. If he has to work in a cold, ill-lighted, or inconvenient shop, he will be as inefficient, as discontented, and as difficult to handle as if he is under the thumb of a tyrannical and grasping employer.

The methods upon which the Institute proposed to work commended themselves to many thoughtful persons. Amongst the foremost of these was the Right Hon. the Earl of Balfour, who consented to become, and still is, President of the Institute. These methods have proved so right, and so practical in every sense, that within six years of the Institute's birth we see, as we began by saying, Mr. Baldwin, Sir Arthur Steel-Maitland, and Mr. J. H. Thomas as the principal speakers at its annual dinner.

Such an Institute as this ought to be properly housed, to have an adequate library, and abundant facilities for research into its problems, which concern us all very intimately. Any firm can become a member and receive the *Journal* for the sum of £1 per year; any individual can become an associate for five shillings a year.

Several leaders of the electrical industry were present.

The Electrical Purification of Water.

Elsewhere in this issue a description is given of an interesting electrical process for the purification of water, which deserves more than passing notice. For many industrial processes distilled water is a necessity, and in some electricity works the make-up feed water for the boilers has to be purified by distillation, entailing a considerable expenditure of fuel. If the inventor's claim that the electro-osmotic process costs only one-fifth as much as distillation with coal is substantiated, it seems probable that the system will prove useful not only to the users of distilled water, but also to electricity supply authorities as an ideal type of off-peak load. It is true that it may not assume any great magnitude, but every aid to the improvement of load factor should be welcomed.

Electrical Gifts for Christmas.—I.

Some Notes and Suggestions.

We sincerely believe that British sellers of electrical appliances have not yet fully awakened to the possibilities presented by the observance of "times and seasons." It is regrettable that we should have to refer to the United States again, but we are compelled to say that things are ordered much better there in this direction. Dealers in that country not only realise that popular festivals can be made to bring business to them, they actually institute "seasons" for the purpose. For instance, they discovered that there were more marriages in June than in any other month; accordingly during May and June every retailer of electrical appliances advertises, each in his own way, presents for "June brides." Remarkable reports have been received of the results of this particular "stunt." Then, in addition to the religious festivals, which Americans celebrate in common with ourselves, they have a number of civil commemorations, *e.g.*, "Thanksgiving" and "Independence" Days, all of which are turned to good account by the pushful American dealer.

If the two can be combined, as is so often the case with electrical appliances, so much the better.

Apart from domestic appliances, no doubt radio apparatus will be in great demand this Christmas. As in the case of household devices, radio sets and components offer a wide choice. This year, therefore, in our suggestions for Christmas gifts we have included a few examples.

While novelty is no doubt a *sine quâ non* to many purchasers of Christmas presents, the standard electrical lines possess sufficient attraction for the majority. Therefore, although we have endeavoured to include as many new ideas in this article as possible, we have also introduced a number of familiar appliances to give an indication of the many directions in which Christmas gifts can be, and will be, sought.

We must not neglect to remind dealers of the opportunities which are open to them of arranging seasonable and effective window displays. Electrical traders must not be behind in this respect, nor, indeed, is there any excuse for them to be. Practically all of the large manufacturers of domestic appliances are willing to provide material for these displays, and the British Electrical Development Association exists to offer suggestions and suitable "literature" to drive home the idea of electrical Christmas gifts. There is still ample time to make the necessary arrangements for this display and publicity matter, for, generally, existing stock can be put forward as suitable presents.

While we believe that much more might be made of these special seasons, we realise that at Christmas, at least, British electrical dealers do make efforts to impress the public with the value and utility of electrical gifts. We think that utility should be the first consideration stressed, for in these days of money scarcity a useful gift is worth many times one that is merely a token. Next to utility we would place decoration, as this is an attribute of a great deal of electric lighting equipment.

Fig. 1. The "All-Nite-Light."

Fig. 2.—A Toy Transformer.

Fig. 3.—The "Tungar" Battery Charger.

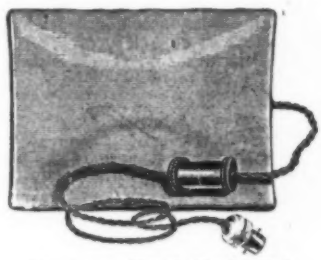


Fig. 4.—An Electric Heating Pad.

Fig. 5.—A 4-valve Radio Set.

Fig. 6.—An Electrical Tea Service.

Fig. 7.—An Egg Boiler.

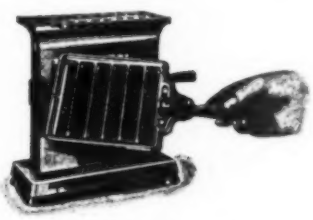


Fig. 8.—The "Eutherme" Toaster.

Fig. 10.—An "Electric" Toilet Mirror.

Fig. 9.—A Bed Warmer.

Fig. 11.—A "Juniorlite" Adjustable Lamp.

Fig. 12.—A Table Lamp.

The British Thomson-Houston Co., Ltd., considers that its small transformers are suitable Christmas presents. One of them, the "All-Nite-Lite" transformer (fig. 1) is certainly a useful gift. This device plugs into the ordinary lampholder and steps down the voltage for the purpose of supplying a 6-V bulb which is connected in the secondary winding. It is made for primary voltage ranges of 100/150 and 200/250, and is thus available for practically any a.c. supply. Another form of transformer is that illustrated in fig. 2, which is designed for the operation of electrical toys (such as railways), or other purposes for which low-voltage alternating current is required. The "Tungar" transformer-rectifier (fig. 3) is a very familiar device, and is very useful for home battery charging.

Messrs. Ward & Goldstone, Ltd., suggest two extremes (from the expense point of view). A simple and cheap device is the heating (or soothing) pad depicted in fig. 4. For those with longer purses the 4-valve cabinet receiver shown in fig. 5 is a gift which would be greatly appreciated. In the Jacobean style, the set is a handsome addition to the furniture of a room as well as an efficient radio set.

Some beautiful appliances are turned out by the British B.A.G., Ltd. Among them is the tea service illustrated in fig. 6. This consists of an electric tea-pot (2 pints, 450 W) in hammered antique brass, accompanied by a cream jug and sugar bowl to match, all on a tray of the same material. The egg boiler (fig. 7) is rather novel. It is itself egg-shaped, and contains a holder for four eggs; the material is nickel-plated brass and the loading is 225 W. Fig. 8 shows the firm's "Eutherme" toaster. This also has a nickel finish, and two most ingenious bread holders are provided which can be easily reversed without danger to the fingers. The loading in this case is 400 W. Another useful appliance is a bed warmer (fig. 9), a nickel-plated device on the lines of the antique warming pan, a 30-W element taking the place of the live coals.

Fig. 13.—Hairdressing Equipment.

Fig. 14.—A Table Cooker.

Fig. 15.—The "Junior" Crystal Set.

Fig. 16.—An Electric Massage Vibrator.

Fig. 17.—The "Handilite" Pocket Lamp.

Fig. 18.—A Travelling Iron Equipment.

An electric kettle is another useful table appliance. Only electric kettles can properly be boiled at the meal table, for spirit stoves are prone to emit odours and incur accidents. Fig. 20 shows a kettle made by Premier Electric Heaters, Ltd. A "table" appliance of a different order, made by the same company is the iron illustrated in fig. 21, which, it will be observed, has a thumb-rest which relieves the strain on the hand, and a strong connector and flex guard.

Fig. 19.—A "Jackson" Table Cooker.

Fig. 20.—An Electric Kettle.

Fig. 21.—A "Premier" Iron.

Messrs. Berry's Electric, Ltd., have introduced a new form of their toilet mirror (fig. 10). This is intended to stand on a table and a small electric lamp behind a lens projects a beam of light on to the face. The lamp also prevents obscuration of the mirror by the condensation of the breath.

While it may be said that most domestic appliances are gifts for ladies, that illustrated in fig. 13 is undoubtedly of this class. Not only can the device be used as curling tongs, a special form of comb can be fitted, as well as a little addition of whose object we are ignorant. This and the articles shown in figs. 12 to 14 are supplied by Messrs. L. G. Hawkins and Co., Ltd. Fig. 12 is a decorative but serviceable table lamp; and fig. 11 is a "Juniorlite" adjustable lamp. A table cooker is shown in fig. 14. This appliance is capable of performing more than its size (6¾ in. square) would suggest; it has a 650-W loading.

As was to be expected, the General Electric Co., Ltd., has a number of lines which are suitable for presentation this season. The company has a wide selection of radio apparatus, elaborate and simple, and an example of the latter class is the "Junior" crystal set shown in fig. 15. Electric massage is becoming very popular and it can be applied at home by means of the vibrator set depicted in fig. 16. A very handy equipment is the travelling electric iron outfit (fig. 18); an adjustable connector permits the iron to be used on 100/125-V or 200/250-V circuits and the set weighs only 2¼ lb. The short-lived flash lamp battery can be dispensed with by the employment of the "Handilite" pocket lamp illustrated in fig. 17.

The development of table appliances has reached such a pitch that the kitchen need not now be relied upon to provide breakfast. With the equipment shown in fig. 19, a table plate made by the Jackson Electric Stove Co., Ltd., the morning meal can be prepared "sitting." The hob surround into which the actual cooker is fitted can be omitted if desired, but it forms a useful addition. The loading can be either 800 or 1,300 W as required, and a three-heat switching arrangement (as illustrated) can be fitted.

American Christmas Gift Expenditure.—*Electrical Merchandising* calculates that the average American family expends $100 upon Christmas gifts, basing its estimate upon information gathered by department stores. Our contemporary says:—"With dozens of different useful and attractive articles in stock—with merchandise that appeals to the Christmas buying spirit, beyond all others—certainly the electrical merchant is in a strong position for the Christmas market ahead. It is up to him and to the aggressiveness of his selling during the next few weeks as to how much of each $100 Christmas appropriation will be rung up on his own cash register."

While it cannot be said that the average English family can afford to spend £20 upon Christmas presents, the rest of the above-quoted note may be applied to English conditions. Particular attention should be paid to "aggressiveness" of selling for only by this means will maximum results be obtained.

Modern Electric Cookers.

A Review of the Recent Improvements in Electric Cooking Stoves.

(*Continued from page* 810).

WE illustrate in fig. 9 the construction of the element unit of the "Cosmos" boiling plate, to which reference has already been made. It is covered by a slotted metal top plate arranged so that the slots come between the element spirals. The General Electric Co., Ltd., is now supplying only the open type of boiling plate in its latest cookers. The "Magnet" plate, fig. 10, consists of spirals of nichrome wire wound on and held in a

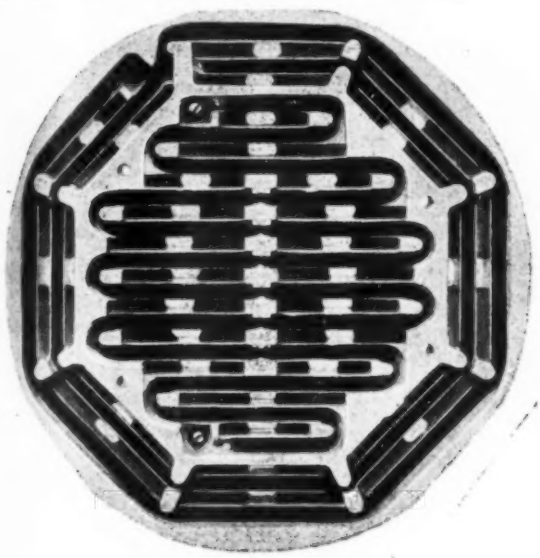


Fig. 9.—Semi-enclosed Plate.

specially constructed fireclay base. It is contained in a metal frame which can be easily removed by releasing four screws and the terminal bolts.

A particularly interesting design of the enclosed pattern of boiling ring is that adopted by Messrs. Belling and Co. in their latest production, the No. 6 "Belling" cooker. The makers have incorporated a new design of element unit, known as the "Honeycomb" (fig. 11). It is built entirely of fireclay, nickel chrome, and cast iron. The element spirals are threaded through holes

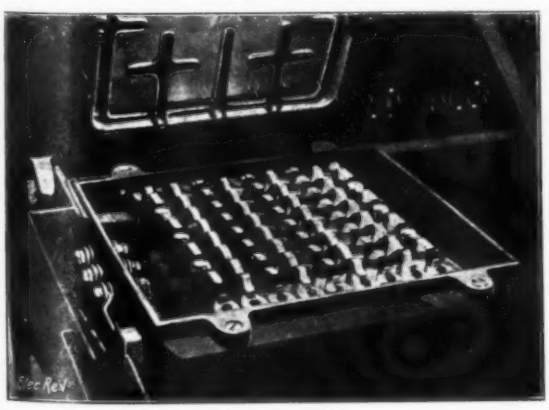


Fig. 10.—Open Plate.

in rectangular bars of fireclay, the holes being so placed that the bars are brought flush with one another, thus presenting a flat surface direct to the cooking utensils. In this way the spirals are fully protected by the fireclay in which they are housed, it being claimed that the sections are packed so closely that any spilt liquids cannot possibly reach the wire. The bars are made of fireclay with good heat-conducting properties at red-hot temperatures. The spirals are made off at plug-in terminals, and the whole is contained in a metal frame, so arranged that it may be "slid" into position in the cooker on rails or guides specially provided; plug sockets are suitably placed in the cooker framework to receive the plug terminals. The principal interest in this plate is that, while it is claimed to be of the fully-protected pattern, only the fireclay, in which the elements are contained, intervenes between the spirals and the cooking utensil. The insulating material is made in sections to accommodate contraction and expansion and to assist in radiation. The "Honeycomb" plate is arranged so that it may be used at both the top and bottom sides, hence being suitable for both boiling and grilling operations. Deflector

Fig. 11.—Closed Plate.

plates are arranged at the top and bottom of the unit, so that if only one side is required, the other side may be covered, and the whole of the heat from the elements deflected in the direction necessary. The spiral ducts are arranged very closely in the "Honeycomb" plate, and a large quantity of heavy gauge wire is used, giving it a claim to longer life than in the case of a short fine wire, also that in relation to the current density in the wire a higher temperature is obtained. It is also claimed that oxidisation is largely reduced owing to the wire being practically excluded from contact with moving air.

Generally speaking, the developments in the griller have followed closely those of the boiling plate as far as the complete electric cooker is concerned. An important improvement adopted in several makes is that where, while the bulk of the heat from the grilling elements is directed downwards to the crown plate, pro-

Fig. 12.—Boiling Ring.

vision is made in the hob plate above the elements for utilising the upward or otherwise waste heat for warming operations. In the more recent "Jackson" cookers, the grilling plates are attached direct to the hob plate. In the latest "Xcel" cookers, the grilling unit is composed of parallel fireclay bars through which nickel chrome spirals are threaded. Plug-in contacts are employed, as in the case of the boiling plates, 3-pin plug terminals being provided. The elements are wired so as to give 3-heat regulation, and a damping plate is provided so that the unit can also be used as an additional boiling plate. The damping device will slide underneath the

griller if it is desired to use it for boiling only; or, if it is used as a boiling plate while grilling operations are in progress, the damping plate will, of course, be removed altogether.

Apart from the boiling plates incorporated in the construction of the usual cooker, several firms are placing

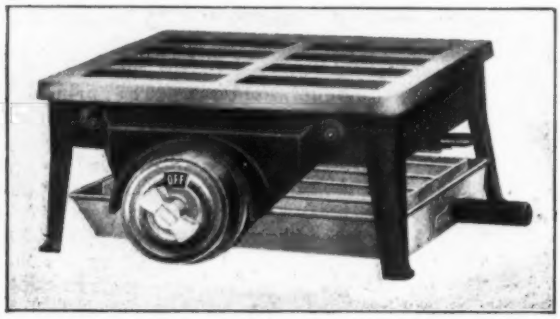


Fig. 13.—Table Plate.

on the market separate portable boiling and grilling units. These have necessarily to be made more substantially than in the case of the stationary unit, and probably to gain this end, something in the way of cooking efficiency has to be surrendered. Nevertheless, a strong portable cooking plate proves of great value in many cases. Fig. 12 shows such an apparatus made by Messrs. Belling & Co. It is described as the No. 7 boiling ring, and is of the open type. The frame is of fine-grain cast-iron, and the whole device is constructed to stand rough kitchen use. The Arora Co. has also produced an interesting boiling plate unit. It is of the open type, contained in a cast-iron frame, and consists of three sector-shaped elements of 500-kW capacity each. It is provided with a 4-heat control. The table plate shown in fig. 13 is an apparatus of this description, made by the Jackson Electric Stove Co., designed for both grilling and boiling.

It is a widely supported claim that cooking by means of electricity results in the nutritive value of the foodstuffs being retained in them in a manner superior to that in the case of other methods of cooking. It is in the oven that the general support to this claim is usually found. There are, in the main, two schools of thought also with reference to the position of the heating elements in the oven. On one side it is declared

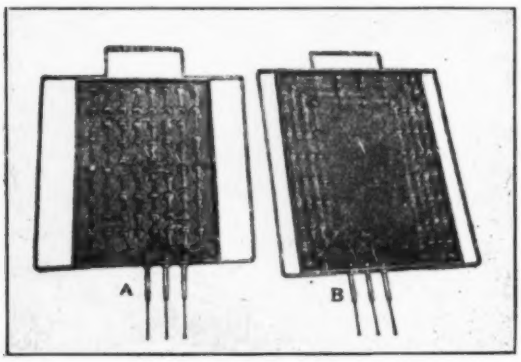


Fig. 14.—Oven Elements.

that the best results are obtained if the elements are placed at the top and bottom of the oven, it being maintained that a better heat circulation is produced. On the other hand there is the view that an even distribution of heat is necessary throughout the oven and that this can only be obtained with the elements placed at the sides so that the greater amount of heat is emitted near the bottom. In the "Universal" cookers the elements are placed at the top and bottom. The top element, which is of the open or exposed variety, is intended to be used for grilling purposes other than for heating the oven. Both units are employed to bring the oven quickly to the desired temperature, when the upper one may be "switched off."

Fig. 14 illustrates the construction of the oven elements, A, top, and B, bottom. They are arranged on the plug-in principle and are suitably connected for 3-heat regulation. The broiler element has a maximum loading of 1,500 W, and the consumption of the lower unit is 2,000 W.

Horizontal parallel side elements are adopted in the "Xcel" cooker. These are of 350-W capacity, and are standardised to fit on to standard busbars, and, as is the modern tendency, are so located as to give a maximum bottom heat, with two element bars nearer the top for browning. These are all protected by sheet-steel gate linings arranged on hinges so that they may be readily cleaned or removed altogether. It is claimed that the cooking temperature is reached in approximately 18 minutes from cold, and that with the switch then in the low heat position the cooking temperature will be maintained. The arrangement and housing of the elements in the Jackson cooker are very similar to those in the last-mentioned apparatus. The horizontally-arranged elements are attached to vertical solid bars by means of lugs and bolts. An extension of the lug is taken along the back of the clay giving it a stiffening. The clays are of a special mixture of fireclay and are

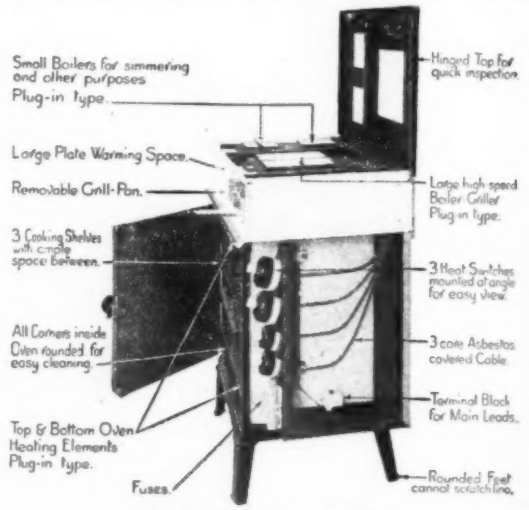

Small Boilers for simmering and other purposes Plug-in type.
Hinged Top for quick inspection.
Large Plate Warming Space.
Removable Grill-Pan.
Large high speed Boiler Griller Plug-in type.
3 Cooking Shelves with ample space between.
3 Heat Switches mounted at angle for easy view.
All Corners inside Oven rounded for easy cleaning.
3 core Asbestos covered Cable.
Terminal Block for Main Leads.
Top & Bottom Oven Heating Elements Plug-in type.
Fuses.
Rounded Feet cannot scratch fire.

Fig. 15.—Construction of Cooker.

standardised. They are made up of three pieces to allow for expansion and easy replacement. The spirals, which can be obtained separately and rewound on the clays, are made off under nickel washers. They are wound in grooves in the clays, in which are provided small pips, which are gripped between the coils, holding the latter in position when they are subjected to abnormal heat expansion. As in the case of the boiling plate, the elements are interchangeable throughout 14 sizes of cookers. Fig. 1, p. 766, affords an excellent idea of the construction of the modern "Jackson." The side oven elements are spaced so as to radiate the bulk of the heat at the bottom of the oven. In the smaller ranges three elements are provided on each side, two at the bottom and one in the centre; in the larger sizes four elements are provided spaced out on the same lines.

Messrs. Belling & Co. adhere to the practice of installing the elements at the top and bottom of the oven. They have adopted the plug-in element similar to the arrangement in connection with the "Honeycomb" elements for the boiler and grid plates. The sockets are held in porcelain bushes in the back of the oven, and the element is slid into position on rails or guides. Fig. 15 shows the general construction of the new No. 6 "Belling" cooker.

All the general cooking in the oven of this cooker is done by the bottom heater only, which, with its heat-dissipating and protecting shutters, results, it is claimed, in an even cooking temperature throughout the oven without any burning. The top heater, which is used to give a quick initial "heating-up" and for the final browning, can also be used for grilling purposes.

(To be concluded.)

Electricity Supply in Isolated Villages.

An Interesting Installation in Norfolkshire.

THE possibilities of supplying outlying villages with an efficient service of electricity for lighting and power purposes are being tested with very successful results in the village of Brundall, which lies about seven miles to the East of Norwich, in Norfolk. The village is exceptionally well served with transit facilities by two railway stations on the L.N.E.R. system, and a frequent service of motor-'buses to and from Norwich and Yarmouth. It has also the additional advantage of being pleasantly situated on the north bank of the River Yare. In 1921 the population of Brundall amounted to 633, since when it has probably increased by 50 per cent., as extensive building operations have been going on for some years, and are still in progress. It had been felt for a considerable time by some of the residents that three-phase current, at 6,000 volts, 50 cycles, in a transformer house situated in the centre of the village. At this point it is transformed down to 400 volts for power, and 220 volts for lighting.

The main cables from Norwich are laid underground, but distribution throughout the village is effected by overhead bare copper wire, carried on poles as shown in fig. 1. After transformation, the current passes to a main switchboard in the transformer house, where the supply is divided into two sections, one supplying the east side and one the west side. The capacity of the transformer is 50 kW, with a present maximum load approaching 36 kW. The overhead mains consist of 0.04 sq. in. bare copper phase wires with split neutral 0.0125 sq. in. The main line is about 1½ miles in

Fig. 1.—Distribution Line.

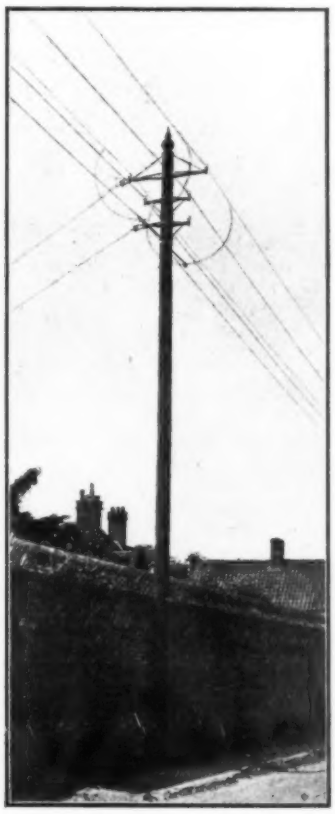


Fig. 2.—Straight-Line Pole Fittings.

Fig. 3.—Public Lighting Connection.

an adequate supply of electricity was essential in the absence of gas or any other form of lighting or heating supply. So on February 25th, 1924, a company was formed with a capital of £4,000 to carry out an agreement made with the Norwich Corporation, by which energy would be purchased in bulk and distributed by the company from its own mains. Application was then made to the Electricity Commissioners for a Special Order, to give the company distributing powers in the parishes of Brundall, Blofield, and the surrounding area. Work was commenced in October, 1924, and on December 24th the first three consumers were connected to the system. At the end of August, 1925, about 60 consumers had been connected up, and 13 electric cookers and various motors for pumping and general purposes installed. Of these consumers, seven had private installations, which have been entirely replaced by the company's supply. Under its agreement with the Norwich Corporation, the company receives length, along which all three phases are taken with single- and two-phase distributors over roads branching from the main, fig. 4. The straight-line pole fittings are well shown in fig. 2, the top cross arm carrying the split neutral, and the two lower arms the three phase wires, with a spare insulator for a switch wire in the event of street lighting being required, fig. 3, which undoubtedly will be the case in due course. This arrangement will permit street lighting to be controlled from the transformer station, where the energy can be separately metered, and it will avoid the expense of employing men for lighting and extinguishing lamps. Near each pole a guard wire encircles the live conductors, as can be seen in the illustrations. The main street in places was heavily wooded, and a great deal of tact and trouble was involved in pacifying frontage owners when obtaining permission for the very small amount of cutting away that was actually undertaken. The Post Office, as usual, being first-comers, occupied the clear runs with

poles carrying 18 or more pairs of wires. Special guarding was undertaken to comply with the P.O. requirements, and in this respect fig. 5 shows clearly the "cage" erected, consisting of bare copper horizontal wires in line with the split neutrals. Below them the two sets are joined up at the sides and bottom by cross members. Some such arrangement, although probably entirely unnecessary from a safety point of view, is held to be compulsory, and the difficulty at once arises as to the possibility of the "cage" shorting the phase wires under the pressure of strong winds. To overcome this difficulty, special insulated stay pieces are connected in at proper intervals, between the phase wires and the guards, which have the effect of preventing the "cage" swinging more than a few inches.

Fig. 4.—Branch Line.

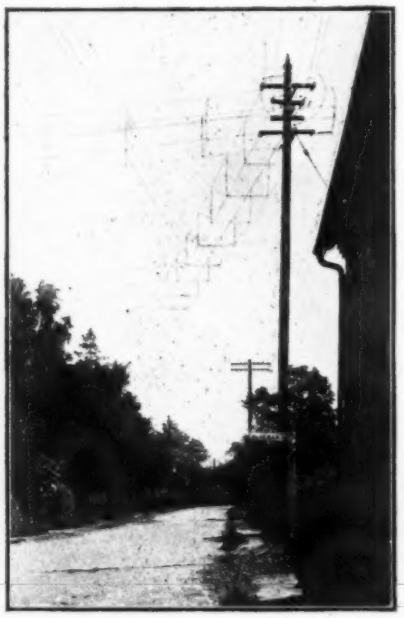


Fig. 5. Special Guarding Arrangements.

Fig. 6.—Supply Service.

Fig. 6 shows the arrangement for the three-phase supply to the Brundall pumping station. Consumers' services are also carried overhead, being jointed in the copper bridges with special mechanical connectors; either bare or "P.B.J." wires are employed, according to the position. In certain cases, as shown in fig. 1, the split neutral has been bridged across the top where the supply wires run under the G.P.O. conductors. As it is the company's intention to encourage the use of electrical energy for purposes other than lighting, the "Norwich" method of charging has been adopted, and the terms are 25 per cent. on the gross rateable value, in addition to 1½d. per kWh; wiring costs are simplified, only one meter is required, and the final cost per kWh becomes more favourable as the consumption increases. The carrying-out of this installation throws an interesting light on the difficulties to be overcome in supplying such rural areas. The pious hope expressed by various Ministers, that schemes of this kind would be helped and encouraged in every possible way, is not borne out in actual practice. Nearly every frontage owner discovers that his trees are exceedingly valuable, and a blank refusal to allow them to be trimmed is generally followed by permission, subject to payment. The payment for wayleaves is a very serious item in a small distribution system, and it would appear quite time that a definite decision should be obtained as to the actual rights of frontage owners who have trees growing within their boundary, but the branches of which overhang the highway from 3 to 12 or 15 ft. Such difficulties would not arise with underground mains, but the capital cost would at once increase the price of energy, and every service from an underground cable would cost at least four times the amount for a similar overhead service. The contractors for the whole of the overhead work, transformer house, switchboard, &c., were Messrs. W. T. Henley's Telegraph Works Co., Ltd., London, and the consulting engineer was Mr. G. T. Redgment, of Norwich.

The Electro-Osmotic Softening of Water.

A Method of Purification Much Cheaper than Distillation.

By W. G. RUMBOLD.

In *Elektrotechnik u Maschinenbau* of October 18th, Dr. Erwin Mayer contributes an interesting article on the above subject.

The following is an abridged translation of the article, which states in a simple manner the method of obtaining either practically pure water comparable to distilled water, or a soft water of a less degree of purity by means of the electro-osmostic method.

It is a fact long known that salts which are electrolytes dissolved in water are dissociated into positively and negatively charged ions known as cations and anions. The metals and hydrogen form cations and the acid radicles the anions. This property of electrolytes was first suggested by Arrhenius, and is now generally accepted as the true explanation of certain phenomena associated with the behaviour of these salts in water.

Under the influence of the electric current, as in electrolysis, the anions are attracted to the anode and the cations to the cathode.

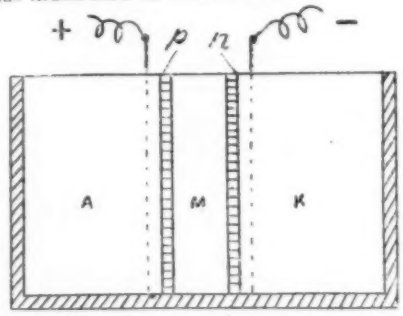
Taking a water which is hard, due to the presence of calcium sulphate in solution, the action of the electric current is that indicated in the following equation:—

$$CaSO_4 \rightleftarrows {}^{++}Ca + {}^{--}SO_4$$

The Ca ion is attracted to the cathode and the SO_4 ion to the anode. In consequence of secondary action, the Ca is converted into calcium hydroxide and the SO_4 to

sulphuric acid according to the equation: $Ca + 2HOH = Ca(OH)_2 + H_2$ and $SO_4 + HOH = SO_4H_2 + O$. Other salts usually found in natural waters behave similarly.

Under the influence of the electric current, the decomposition products are not removed, but remain in the water. In order, therefore, to obtain a pure water, these decomposition products must be eliminated. This can be successfully accomplished by separating the electrodes by suitable diaphragms which will permit the passage of the ions, but not that of the water molecules. This can be carried out in a so-called three-cell apparatus illustrated in section below.



Three-cell Apparatus.

The middle space M contains the water to be purified, and this is separated by two diaphragms *n* and *p* from the electrode spaces A and K. As explained above, the ions are attracted to the respective electrodes, with the result that the water in M gradually loses the dissolved salts by the passage of the ions through the diaphragms to the electrodes, becoming first softened, but in course of time entirely freed from dissolved salts. It is obvious that the degree of purification is a matter of choice, and depends upon the duration of the passage of the electric current. It is further obvious that this method of purifying water is an alternative to distillation.

With a single three-cell apparatus the purification process is an intermittent one. In practice, however, it is usual to make it continuous by using a series of these, usually ten, arranged very much like a filter press. The water to be purified is introduced into the middle space of the first of the series and by an automatic arrangement is conveyed to the corresponding space in the second, and so on through the series until it leaves the last either in a completely purified condition, or at the degree of purity it is desired to reach. The electric pressure is regulated for each one, being least in the first, and being gradually increased up to the end. This regulation depends upon the fact that resistance to the current increases as the salts are removed from the middle space.

The expenditure of energy for purification is governed on the one hand by the degree of hardness of the water and on the other by the degree of purification sought. For complete purification of a Vienna water of 10 degrees of hardness, about 1.8 kWh is necessary per hectolitre (22 gals.), while for a water of 20 degrees of hardness about 2.5 kWh is necessary. Treatment down to 2 to 3 degrees of hardness would require from 0.4 to 1.2 kWh for waters with an original hardness of from 10 to 25 degrees.

In all cases the production of pure water by the process is cheaper than distillation. The author states that under ordinary conditions the cost is about one-fifth that of distillation by coal fuel, or one-tenth when gas is used as the fuel.

In comparing the cost of softening boiler water by the electro-osmotic process with the chemical methods used for the purpose, the cost of electricity is the deciding factor, but the electro-osmotic process can be successfully used in the cases of certain waters which cannot be softened successfully by any other known method.

The process works practically automatically, requiring the minimum of attention. It can be advantageously worked during the night when the rate for energy is lower.

The extensive development of hydro-electric power in Austria has made it desirable to widen the basis of power application, and for this reason alone, the introduction of the electro-osmotic method of water softening is welcomed as furnishing a new use for electricity, if only in a subordinate degree.

Notes on Induction Motors.

The Influence of Connections on the Resultant Magnetic Field.

By S. W. SWANN, B.Sc. (Eng.)

The following notes on the influence of the connections of the windings on the resultant magnetic field in a three-phase induction motor may be of some interest. Three cases arise, *viz.*:—

(*a*) Any two phases interchanged.
(*b*) One phase reversed.
(*c*) One phase omitted.

Case (*a*).—The effect of this is to reverse the direction of rotation of the resultant magnetic field without altering its magnitude. This is a well-known result, and may easily be demonstrated by resolving the three alternating magnetic fields into their equivalent rotating components, paying due attention to the various phase relationships.

Case (*b*).—The vector diagram of the magnetic fields for this case is shown in fig. 1, where phase three has been reversed. Assuming the sequence of phases to be 1, 2, 3, the disposition of the various equivalent rotating fields at the instant when the current in phase 1 is a maximum is as indicated in fig. 1, where the rotating fields 1 and 2 are equivalent to the alternating field of phase 1; 3 and 4 refer to phase 2, and 5 and 6 to phase 3. We see that the rotating components 1 and 6 continually neutralise one another. If ϕ_m denote the maximum flux due to each alternating field, then components 2, 5, and 3 unite to form a single rotating field of magnitude ϕ_m and coincident with component 5 at the instant under consideration. The resultant magnetic field is therefore as indicated by

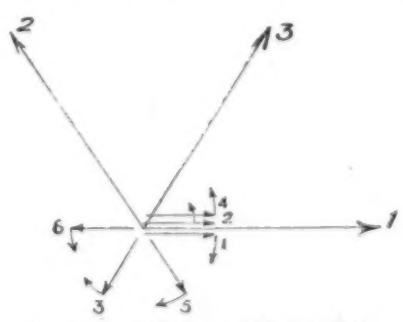


Fig. 1.—Vector Diagram of Magnetic Fields.

the vector diagram of fig. 2. Obviously, the two components coincide in direction along the dotted line ox. It is most convenient to decompose the rotating vectors into components along the rectangular axes ox, oy.

taking the zero of time at the instant when both vectors lie along ox. We therefore have —

$$x_1 = \tfrac{1}{2}\phi_m \cos\omega t,\quad y_1 = \tfrac{1}{2}\phi_m \sin\omega t,$$
$$\text{and } x_2 = \phi_m \cos\omega t,\quad y_2 = -\phi_m \sin\omega t,$$

paying attention to the opposite angular velocities, the suffixes 1 and 2 referring to the vectors $\phi_m/2$ and ϕ_m respectively. Combining these results we have—

$$x = x_1 + x_2 = 3/2 \cdot \phi_m \cos\omega t$$
$$\text{and } y = y_1 + y_2 = -\tfrac{1}{2}\phi_m \sin\omega t$$

for the rectangular components along ox and oy of the resultant magnetic field at any instant. From this we obtain— $x^2/(3/2 \cdot \phi_m)^2 + y^2/(\tfrac{1}{2}\phi_m)^2 = 1.$

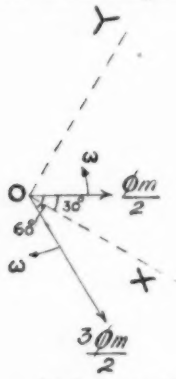


Fig. 2.—Vector Diagram of Resultant Magnetic Field.

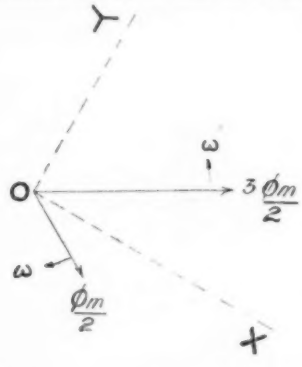


Fig. 3.—Rotating Vectors.

Therefore, the locus of the extremity of the vector of resultant instantaneous flux is an ellipse whose axes lie along ox and oy. The orientation of these axes is symmetrical with respect to the vectors 1, 2, and 3 in fig. 1.

In this case, therefore, the field is not constant in magnitude, but varies from $\phi_m/2$ to $3\phi_m/2$.

Case (*c*).—Supposing phase 3 to be open-circuited, it is easily seen that the system of rotating vectors is as shown in fig. 3. This is the same as fig. 2, except that the vectors ϕ_m and $\phi_m/2$ are interchanged. The detailed investigation of this case may be made in the same manner as for case (*b*). It will be found that the locus is the same, *i.e.*, an ellipse of semi-axes $\phi_m/2$ and $3\phi_m/2$. Also, at any instant, reckoning the epoch zero when both vectors lie along ox, the resultant flux vector is of the same magnitude in each case, but not in the same direction. In fact, the inclinations to ox of the vectors of resultant flux are given by—

$$\tan\omega t = -3\tan\theta \text{ (case (}b\text{))},$$
$$\tan\omega t = \ \ 3\tan\theta' \text{ (case (}c\text{))},$$

so that the angles θ, θ' are equal and opposite in sign. Of course, this is due to the fact that the vector of resultant flux rotates in opposite directions in the two cases, the direction of rotation being the same as that of the predominant rotating component in each case.

The torque produced under the circumstances of cases (*b*) and (*c*) is naturally irregular, and a characteristic pulsating sound issues from the motor.

Electrical Power Development.

A Review of the Electricity Supply Industry in Great Britain.*

STUDENTS of human progress have long recognised that the enthusiasm of the few is far more potent in effecting changes than the needs of the many. The vague desires of the multitude for betterment have to be concentrated on some definite scheme which promises an increase in wealth or comfort, and not until this has been done can the inertia of the mass opposing change appear as an irresistible force to bring it about. The public in this country, and the politicians who represent them, have at length been aroused to some appreciation of the advantages which would ensue from a more energetic development of electricity supply, and the appointment of the Electricity Commission after the war was an outward and visible sign of awakened interest. The enthusiasts have so far succeeded in converting the nation that every political party now places electrical development in the programme, and no public speaker would dare to depict a millennium in which electricity did not flow in the land like milk and honey.

This state of affairs, gratifying as it may appear to those who have laboured for the recognition of electricity as one of the essential factors of modern civilisation, is by no means free from danger. The mantle of prophecy has descended from the shoulders of the instructed few to those of the uninstructed many. The labourers of the eleventh hour are tempted to make up for their earlier aloofness by exuberant manifestations of energy, promising an immediate crop of impossible fruits if only they are allowed to manage the garden their own way. Now that public interest in electrical development is definitely aroused, it is more than ever important that public opinion should be correctly informed. A good case is merely weakened by exaggeration, and the best object in the world may be frustrated by trying to obtain it in the wrong way. It is only by propaganda that public opinion can be directed, and all who hope for the national benefits from a cheap and abundant supply of electricity are in duty bound to see that the economic effects to be expected are accurately stated and that political ideals are kept distinct from questions of engineering.

That the propaganda in favour of electricity in general has brought about a most welcome change in public outlook is undeniable, and we would not like to see it diminished. Hence the appearance of a book dealing with the national aspects of power development, written in such a way as to appeal to the educated layman, is to be regarded with pleasure.* The author, Mr. Hugh Quigley, has collected many of his contributions during the past few years to the technical and lay Press, and expanded them into a well-written and interesting volume of over 150 pages. A foreword by Mr. D. N. Dunlop, Director of the B.E.A.M.A., expresses the view that "Electricity is one of the fundamentals which will modify in the near future our whole industrial complex, and suggests that the book should be considered from this point of view. This, indeed, appears to be the underlying idea of the author, who shows by numerous diagrams and statistics what has been accomplished so far towards bringing nearer the state of affairs which he desires.

The book is extraordinarily free from any taint of political prejudice. Credit is given fairly to both municipalities and power companies in the main industrial areas for "having co-operated in advancing the cause of electricity through reasonable rates and effective service," and nowhere in the book is a partisan spirit observable. Controversial points, however, are to be found in plenty. The policy of interconnection, for example, is strongly advocated, though the author, like all other supporters of this policy, fails to show exactly how the presumed improvement of load factor is to be brought about by it. The inhabitants of every town in England have much the same hours of work and sleep. They all want power and heat during the day, light during the evening, and very little electrical energy of any kind from midnight till morning. The

*"Electrical Power and National Progress," by Hugh Quigley; with a foreword by D. N. Dunlop. Pp. 160; 18 figs. London: George Allen & Unwin, Ltd. Price 8s. 6d. net.

aggregate load factor of a number of towns is therefore substantially the same as the load factor of any one of them, and there is nothing to be gained by interconnection, except possibly a greater security of supply and a reduction of stand-by plant. The latter benefits are quite enough to justify the interconnection of near-by stations, but the idea of materially improving load factor or cheapening electricity by general interconnection on a national scale appears to be a pure myth.

More than once the author shows a certain want of appreciation of technical considerations. It is true that his statement that "the place for the electric power station . . . is in the heart of the coal-field" is somewhat negatived by a warning later in the book that "in this country the insistent advocacy of pit-head stations using coal at the place of extraction has tended to divert attention from the realities of the case." With the latter sentence we cordially agree. If the people who so glibly advocate pit-head stations could be got to understand that for every ton of coal burned in the furnaces six hundred tons of water at least has to be pumped through the condensers, less nonsense would be talked on the subject. Coal can be, and is, transported cheaply to any spot in the country, whereas water, in the immense quantities required by a modern power station, is only available in the places where Nature has provided it. In this connection it is not at all clear what Mr. Quigley means by his statement that "there is no water supply available in this country to provide condenser cooling water . . . for stations above 200,000 kilowatts, and it is extremely doubtful whether an average of 80,000 kilowatts can be exceeded even under the most intensive electrification." Why an island, of which no point is more than 50 miles or so from a sea or ocean, should be short of condensing water is unexplained, nor does the author tell us how the Gennevilliers station at Paris will manage to deal with 340,000 kilowatts, if we cannot exceed 200,000 kW in this country.

"The progress of supply in Paris since the conclusion of the war," he states, deserves careful examination, "since it supplies a clue to the immense improvement in the industrial and economic prosperity of France." This, of course, is special pleading of the worst kind. It would be equally true and equally false to state that the reorganisation of the Paris electricity supply has prevented France from paying her allies for money lent, has reduced the franc to the value of two-pence, and has brought the country to a financial crisis of extreme seriousness. If this is industrial and economic prosperity, France, we think, would be better off with a little less prosperity. The cause of electrical development is not served by statements which are obviously absurb.

One does not like to criticise the arguments in a book with the objects of which every sensible man is in agreement, but central-station engineers will be a little surprised to learn that "A motor working on a power factor of 0.8 is working out of phase . . . with the result that a high percentage of the total power sent out from the station has no earning value." This sentence might perhaps be passed as a loose mode of expression, were it not amplified by an illustration which shows a curious idea concerning the effect of bad power factor. It is stated (with reference to a 100,000-volt overhead line, 132 km. long) that "at 0.9 power factor 84,000 kilowatts can be transmitted to Berlin, while phase adjustment up to unity power factor increases this to 127,000 kilowatts." This point is elaborated by calculations to show that a 90 per cent. power factor increases the selling price of electricity by 50 per cent., and then we read: "the Berlin investigation illustrates on a large scale what is taking place in every part of Britain through low power factor; the capital and maintenance costs of transmission are at least 50 per cent. more than they should be with a proper system of supply at unity power factor." Most engineers, we think, would be glad enough to get even a 90 per cent. power factor on their feeders, and if this involves a 50 per cent. loss we wonder what the author would calculate the losses to be on a certain Continental system we recently inspected where the power factor was usually between 60 and 65 per cent.

In dealing with electrical development in Great Britain, the author has drawn largely on the valuable statistics published this year by the Electricity Commission, and by a judicious selection has brought into prominence many points of interest. Why, for example, have the costs of the generating plants of six large power companies ranged from £38.6 per kW installed, in the case of the South Wales Power Co., to £15.5 in the case of the Clyde Valley Co.? Turning to London, the municipal plants of Stepney and West Ham cost £17.1 and £19.1 per kW installed respectively, whereas the Charing Cross Co.'s plant cost £27.5 and that of the City of London Co. as much as £34.9 per kW installed. As regards the price of electricity, the variations are even more striking. The average price obtained by the Newcastle Electric Power Co. in 1923-24 was only 0.74d. per unit, and the Clyde Valley, Lancashire, Yorkshire and Mersey Companies all sold at an average price of less than a penny. In the London area the average consumer on the County of London Co.'s system has to pay no less than 3.93d. per unit, while his neighbour, who is supplied by the borough of Stepney, only pays 1.48d. on the average. Recent correspondence in *The Times* has shown the dissatisfaction which is rightly felt as regards the prices charged by the London companies, and it is to be hoped that the effect of the recently-formed Joint Electricity Authority will be to bring about a more equitable state of affairs. Whatever views one may hold about municipal trading, it is undeniable that some of the London boroughs have set an example in economical generation and cheapness of supply which the large companies would do well to emulate.

In conclusion, one would like to suggest to the author and to all other propagandists in favour of electricity that much industrial load might be obtained by a more detailed treatment of typical cases than seems ever to be given. If the advocates of main-line electrification, for example, would analyse the traffic between, say, London and Birmingham, showing what it costs now in capital charges, labour, fuel, and maintenance, and then give a corresponding estimate under electrified conditions, they would do much more to further their cause than by pointing out the progress of railway electrification in countries with no coal mines. Similarly in manufacturing questions: what, for example, is the actual cost of power per yard of calico in a steam-driven weaving shed, both actual, and in relation to total costs, and what would be the effect on the latter of reducing the power costs by purchasing electrical power? The case for electrification of all factories in which power is a significant item in the total manufacturing costs is unanswerable, but the benefit must be expressed in shillings and pence if conviction is to be brought home to the manufacturers.

Scholarships in Engineering.—The Council of the British Electrical and Allied Manufacturers' Association (Inc.) has recently granted the following scholarships, tenable for one year, each of the value of £100, together with the payment of college fees:—In Electrical Engineering: John Greenville Jackson, tenable at Faraday House; Felix Samuel Naylor, tenable at City and Guilds (Engineering) College, South Kensington; Frederick James Pepworth, tenable at the College of Technology, Manchester; William Raymond Shepherd, tenable at the College of Technology, Manchester. In Mechanical Engineering: John Stanley Clark, tenable at Birmingham University. In Electrical and Mechanical Engineering: Edward Norman King, tenable at Armstrong College, Durham University. The following scholarships have been renewed:—John Tempest Birtwell, tenable at the College of Technology, Manchester; John Charles Burke, tenable at the College of Technology, Manchester; Arthur Bernard Everest, B.Sc., tenable at Birmingham University; George Emil Gregson Foden, tenable at the Victoria University, Manchester; Isaac Herdman Hedley, tenable at Armstrong College, Durham University; Percy James Maggs, tenable at the City and Guilds (Engineering) College, South Kensington; Harold Giles Richards, tenable at the City and Guilds (Engineering) College, South Kensington.

Business Notes.

Commercial and Industrial Developments, Business Changes, Trade Opportunities, New Publicity Literature, Liquidations and Failures.

E.D.A. Activities.—In our article upon "Electrical Gifts for Christmas," which appears elsewhere in this issue, we mention the aid which the British Electrical Development Association proffers retailers of electrical goods. We have received specimens of the literature which the Association has prepared for the season. One sheet reproduces pictorial advertisements, electros of which can be purchased. These leave ample space for local matter and are very effective. A number of booklets are also available: one, entitled "Christmas Presents," sets forth the arguments for electrical gifts in a very attractive manner.

Employment during October.—The monthly review of employment conditions in the *Ministry of Labour Gazette* states that employment in the engineering trades during October continued bad on the whole, but showed a slight improvement except in the marine engineering section which experienced a marked decline. Employment in the electrical branch was fairly good. The general unemployment figure for the engineering industry was 11.3 per cent., a decrease of 0.2 per cent. In the marine section it was 25.5 per cent., while the electrical branch made the best showing with 5.5 per cent., an increase of 0.2 per cent. There were slight improvements during October in the electrical wiring and contracting, and electrical cable, wire and lamp manufacturing industries.

Unemployment.—The total number of registered unemployed persons on November 16th was 1,196,200, representing a decrease of 1,926 during the week and 12,799 during the past year.

Commercial Electrical Travellers.—The Electrical Trades Commercial Travellers' Association held a successful whist drive and social at Manchester Hotel, Aldersgate Street, on November 21st. The attendance was disappointing, only about 80 members and friends being present, although some 300 invitations were issued. Despite this slight set-back, a very enjoyable time was spent, and the prizes, which were presented to the winners by Mrs. Joyce, wife of the chairman of the Association, were really handsome. The evening was concluded with an excellent musical entertainment provided by Miss Beale and Mr. Bidwell (vocalists), and Mr. Boxall and Mr. Montague (entertainers). The entertainment secretaries and others who were responsible for the programme are to be congratulated upon the arrangements made; their efforts were deserving of much better support.

The British Industries Fair.—The Department of Overseas Trade announces that Canada and East Africa have notified their intention of participating in next February's Fair. Special sections are being organised in London to display Canadian and East African products.

The Shannon Scheme Dispute.—It is reported that the Irish Labour Party and Trade Union Congress have "blacklisted" the Shannon hydro-electric scheme, *i.e.*, they have called upon their members not to take employment under the contractors, the Siemens-Schuckertwerke. The position is that the firm offers labourers 32s. per week, whereas the unions demand 1s. 1d. per hour.

A "Siluminite" Blotter.—THE SILUMINITE INSULATOR CO., LTD., has sent us a blotter (of the rocking type) the parts of which are made of its insulating materials.

Local Exhibition.—BLACKPOOL.—Organised by the Corporation Electricity Supply Department, an electrical exhibition was opened at the Winter Gardens, Blackpool, on November 18th, and will remain open until December 12th. The Department has over 300 cookers on hire and is confident that as a result of the exhibition this number will be greatly augmented. Recently an "all in" tariff for the supply of current for domestic purposes, was introduced whereby a fixed charge of 12½ per cent. per annum on the net assessment for rateable value purposes, is paid quarterly, in addition to a charge of 1d. per unit for the current consumed. The principal exhibitors are:—The General Electric Co., Ltd., "Magnet" electrical appliances, including ovens, restaurant grillers and fryers, irons, cookers, toasters, hot plates, pedestal heaters and radiator fires, washing machines, &c.; Messrs. J. W. Fielding & Co., Blackpool, shop and house fittings, electric fires, vacuum cleaners, &c.; Messrs. R. Darbyshire, Ltd., Blackpool, the "Lightfoot" tubular electric heating system, "Exide" batteries, "Crypto" motors, "Hoover" vacuum cleaners, &c.; Mr. George Morrison, Blackpool, heating and cooking apparatus; and Messrs. Jones Bros., Blackpool, numerous applications of electricity in the home and workshop.

Maintaining Supplies during an Emergency.—In order to protect the public in the event of an industrial dispute which may result in the cutting off of supplies of essential commodities, the Government has organised a skeleton system to ensure that all such essentials shall reach the public. The arrangements include means of maintaining coal supplies, and regulations will be made whereby local authorities may place restrictions upon the consumption of gas and electricity in their areas.

Patent Application.—Application has been made for the restoration of Patent No. 174,744 of 1920, granted to Miles Walker for "An electric harmonic analyser."

Parliamentary Notices.—A number of applications which are being made to Parliament for electrical powers appear in the *London Gazette* for November 20th and following issues. We shall refer to the applications in the usual form when the collection is complete.

Trade Announcements.—MESSRS. SUPERADIO, LTD., of Paul Street, E.C.2, ask us to state that they have no connection with Super Radio Co., the defendants in the action referred to on page 840 of our last issue.

THE ELECTRICAL SUPPLIES (LIVERPOOL), LTD., ask us to state, in order to put an end to certain confusion that exists, that they are not connected with the E.S. Company, Ltd., of London and Machester, now in liquidation, or with any other business trading under a name similar to their own.

MR. F. P. FRY, electrical engineer, of Newport, Isle of Wight, has removed his business to larger premises at 80, Pyle Street.

THE CURTIS MANUFACTURING CO., LTD., Paddington, W.2, informs us that it has no connection whatever with Peter Curtis, Ltd., a company which is mentioned under "Private Arrangements" in this issue.

Catalogues and Lists.—THE BENJAMIN ELECTRIC, LTD., Brantwood Works, Tariff Road, Tottenham, N.17.—The "Benjamin Reflector," containing notes on poster lighting, office and shop-lighting equipment, automobile accessories, &c.

MESSRS. NEGRETTI & ZAMBRA, 38, Holborn Viaduct, E.C.1.—Lists Nos. C6 and C9, containing particulars and prices of various forms of distance thermometers.

RADIO INSTRUMENTS, LTD., 12, Hyde Street, New Oxford Street, W.C.1.—A descriptive pamphlet dealing with the company's new h.f. reactive anode unit.

METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester.—A series of new and revised leaflets dealing with the company's productions, including switch- and fuse-gear, motors and motor-controlling equipment, arc-welding plant, &c.

METRO-VICK SUPPLIES, LTD., Trafford Park, Manchester.—An electrical fittings catalogue (244 pp.), beautifully illustrated by the photogravure process. The fittings include bowls, brackets, lanterns, electroliers, and many other kinds of electric lighting equipment. Fully priced.

MR. HARRY MOSS, 82, Leeds Road, Bradford.—Pamphlets advertising "Kohler" lighting sets, "Benjamin" reflectors, and "Whitecap" washing machines.

MESSRS. A. V. WILLMOTT, SON & PHILLIPS, St. John's House, Minories, E.1.—A number of pamphlets dealing with "Formica" insulating material and laminated bakelite products, with price list.

ELECTRICAL UTILITIES, LTD., Tudor Works, Park Royal, N.W.10.—Leaflet H.C./2, containing illustrated particulars of "Utility" electrical heating and cooking apparatus. Priced.

MESSRS. L. G. HAWKINS & CO., LTD., 30-35, Drury Lane, W.C.2.—Two illustrated pamphlets dealing with the "Silverlite" all-metal reflector.

BIRKBYS, Liversedge, Yorks.—A mailing card advertising "Elo" synthetic resin insulation.

THE HOTPOINT ELECTRIC APPLIANCE CO., LTD., 24, Newman Street, Oxford Street, W.1.—A price list of "Hotpoint" electrical appliances and a folder illustrating the company's electric irons.

THE BRIGHTON LIGHTING & ENGINEERING CO., LTD., St. Martin's Place, Lewes Road, Brighton.—An illustrated leaflet describing a new "Tell-tale" switch-fuse unit.

AUTOMATIC & ELECTRIC FURNACES, LTD., 173-175, Farringdon Road, E.C.1.—An illustrated catalogue of "Wild-Barfield" electromagnetic steel-hardening furnaces.

THE RICHARDS THREAD MILLING MACHINE CO. (1918), LTD., 222, Strand, W.C.2.—A priced pamphlet dealing with thread-milling machines for tube manufacturers, &c.

MESSRS. W. H. ALLEN & CO., LTD., Queen's Engineering Works, Bedford.—Catalogue No. 112a, describing the "Allen" heavy-fuel oil engine. Illustrated.

THE CARPAX CO., LTD., 312, Deansgate, Manchester.—Illustrated pamphlets advertising "Homcharger" battery-charging apparatus; "Sangamo" fixed condensers; and various forms of receiving sets and accessories. Priced.

THE ALTON BATTERY CO., LTD., Alton, Hants.—An illustrated leaflet describing the "Alton" battery installed at the Fenny Stratford telephone repeater station. Mention is made of other large contracts carried out by the company.

THE BRITISH THOMSON-HOUSTON CO., LTD., Mazda House, Newman Street, Oxford Street, W.1.—An illustrated folder dealing with "Keldon," "Ace" and "Trojan" lighting fittings, and a device advertising "Mazda" lamps.

MESSRS. T. HARDING CHURTON & CO., LTD., Atlas Works, Leeds.—Circular No. 620, describing the company's induction motors, with performance curves.

MESSRS. RANSOMES, SIMS & JEFFERIES, LTD., Ipswich.—Two priced catalogues, giving full particulars of the company's d.c. motors and dynamos, and induction motors respectively.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—The November "Osram Bulletin," containing notes and articles on the manufacture, sale, and installation of "Osram" lamps and radio valves.

Bankruptcy Proceedings.—T. ROBERTS and J. TAYLOR, trading as Roberts & Co., electrical engineers, 61, Old Town Street, Plymouth, and Fore Street, East Looe. These debtors were to have attended for their public examination at the Plymouth Bankruptcy Court on November 20th. Only the latter put in an appearance, and the Official Receiver said he did not anticipate that Roberts would attend and he might have to make an application with regard to him later. TAYLOR stated that Roberts suggested a partnership, each of them to contribute £150 capital. The witness contributed his share, but Roberts did not do so and made various excuses right up to the time he left. The Plymouth business progressed very well for the first six months. Then they contracted to light the town of Looe with electricity, and opened a branch establishment there, to which debtor attended. Roberts supervised the business both at Looe and Plymouth. The Looe contract was undertaken within a month of their starting business at Plymouth. While debtor was at Looe, Roberts, without consulting him, bought for £1,300 on the instalment system, a plant for supplying ice to the fishing boats. That plant had never been used or even erected. They also started a power station, and laid the cable in certain parts of Looe, but the street lighting had not actually been carried out. They had supplied light to private customers. Taylor, after stating that his partner had absconded, said that he consulted his accountants and at a meeting of the creditors which was convened he made an offer of 12s. 6d. in the £, which was not accepted. Debtor said the intention was to turn the concern into a limited liability company. The statement of affairs showed liabilities for dividend amounting to £3,223. As regarded his own private affairs, the liabilities were £19, and he had no assets. The Registrar adjourned the examination until January 1st.

VERNON REED, 10, Chapel Road, Eastville, Bristol, electrical engineer.—The first meeting of creditors was held on November 18th, at the Official Receiver's Offices, Bristol. The statement of affairs showed liabilities of £334, against assets of £11, leaving a deficiency of £323. Debtor attributed his failure to illness, loss of stock through defalcations of a former employé, and loss through delay in laying cables. He commenced business in December, 1922, as an electrical engineer with £100 capital, his savings. The business was fairly successful for the first six months, when, following a serious illness, he was unable for about 12 months to attend to it. In order to carry on he engaged an assistant but the business gradually diminished. He had several contracts to install electric light in certain houses; he completed the wiring and drew all the monies due for the work done, but could not complete the contracts owing to the delay in the laying of the cable, which was only put in a month ago. He was then unable to complete the contracts owing to lack of capital, and arranged for them to be taken over by another electrician. He became aware of his position about 12 months ago. The case being a summary one, was left with the Official Receiver as trustee.

The following are creditors:—

	£		£
Cottrell, E.	45	Sloan & Co., Ltd.	74
Sutton & Bridgman, Ltd.	150	Devening, —.	35

JAMES WILSON, electrical engineer, 70, Ebrington Street, Plymouth.—A meeting of creditors was held on November 19th. The statement of affairs showed gross liabilities of £657 and assets estimated to produce £412. The Official Receiver said that debtor commenced business in 1919, without capital. In October, 1923, he executed a deed of assignment. A friend purchased from the trustee the stock-in-trade, fixtures and fittings. Debtor stated that trade was satisfactory between 1923 and 1924, but he then had a struggle against ill-health. He was aware of his financial position in the early part of this year, but continued trading in the hope that his health would improve and he could put matters right. The public examination was fixed for December 18th.

W. K. COXON and E. R. WEARE (Western Mfg. Co.), Nurshill, Lydney, Glos.—Trustee, Mr. C. Latham, 78, New Oxford Street, W.C., appointed November 12th.

H. C. PERRY, building and electrical contractor, 206, Mount Pleasant, and Birchfield Road, Headley Cross, Redditch.—Trustee, Mr. T. Easton, Official Receiver, 191, Corporation Street, Birmingham, released November 11th.

R. EMMOTT, electrical appliance merchant and contractor, 1, Manor Street, Bradford.—Trustee, Mr. W. Durrance, Official Receiver, 12, Duke Street, Bradford, released November 11th.

F. H. P. HOOLAHAN (Holloway Bros.), electrical engineer and instrument maker, 16, The Hale, Highams Park, and 299, Holloway Road, N.—Last day for proofs for dividend December 5th. Trustee, Mr. E. Parke, Official Receiver, Carey Street, W.C.

W. K. M. WILSON, electrician and wireless apparatus dealer, 1, Mount Street, Heanor, Derby.—Last day for proofs for dividend December 2nd. Trustee, Mr. L. A. West, Official Receiver, 4, Castle Place, Nottingham.

F. P. CRAWLEY (New Central Garage), electric, radio, and motor engineer, 30, Mincing Lane, Blackburn.—First and final dividend of 5s. 8d. in the £, payable at the offices of Mr. A. T. Eaves, 47, Mosley Street, Manchester.

Dissolutions of Partnerships.—BELL CRYSTAL CO., 108, Dale End, Birmingham.—R. Withers and C. Campbell have dissolved partnership. Mr. Withers will attend to debts and continue the business at the same address.

WYATT & MAYO, electrical engineers, 46, Laygate, South Shields.—Mr. N. W. Wyatt and Mr. J. Mayo have dissolved partnership. Mr. Mayo will attend to debts and continue the business under his own name.

TINGLE BROS., ironfounders, mechanical and electrical engineers, and gasfitters, Bilson Foundry, Cinderford.—Messrs. W. and A. E. Tingle have dissolved partnership.

H. VINCENT THOMAS & Co., mechanical and electrical engineers, 5, Richmond Terrace, Swansea.—Mr. L. V. Thomas and Mr. H. W. Vincent have dissolved partnership. Mr. Thomas will attend to debts.

Company Liquidations.—ARTHUR LANGHAM & SONS, LTD., merchants, Holborn Viaduct House, Holborn Viaduct, E.C.—The statutory first meetings of the creditors and shareholders of this company were held on November 17th at Carey Street, W.C., before Mr. J. Barwick Thompson, Official Receiver. The statement of affairs showed liabilities of £10,730, against assets of £91, leaving a deficiency of £10,642 as regarded the shareholders, the issued capital being £4. The chairman reported that the company was registered as a private company on December 28th, 1923, with a nominal capital of £10,000, and was formed to carry on business as general merchants, importers of articles of Continental manufacture, and exporters of British goods. No established business was acquired, but the real object was to deal in electrical goods, household utensils and radio components. Immediately after the formation of the company, Continental purchases amounting to about £30,000 were made. In May, 1924, the company arranged for the purchase of 10,000 radio headphones; the total purchase price was £4,375, and 14 bills of exchange were accepted in respect thereof. No goods were received and it was ascertained that the manufacturers had gone into bankruptcy and could not execute the order. The company thereupon demanded the return of the bills but without success; they appeared to have been negotiated on the Continent. The circumstances in which the bills had been negotiated required further investigation. The failure of the company was attributed to its inability to obtain delivery of goods from abroad, but contributory causes were insufficient working capital and the bill transactions, which placed the company in serious difficulties. In the opinion of the Official Receiver the failure was due also to lack of proper business methods, extravagant expenditure and mismanagement. The liquidation was left in the hands of the Official Receiver.

REGENT RADIOPHONE CO., LTD.—Winding up voluntarily. Meeting of creditors at the offices of the Liquidator, November 27th. Particulars of claims to be sent by December 31st, to the Liquidator, Mr. E. H. Palmer, Bentinck Buildings, Wheeler Gate, Nottingham.

PORTA RADIO, LTD.—A meeting of members is called for December 21st at 39, Lombard Street, E.C., to hear an account of the winding up from the Liquidator, Mr. M. A. Heyburn.

GENERAL WIRELESS CO., LTD.—A meeting of members is called for December 17th at 31, Budge Row, E.C., to hear an account of the winding up from the liquidator, Mr. R. C. W. Clarke.

DE MARTIS ACCUMULATORS, LTD.—A meeting of members is called for December 21st at Adelaide House, King William Street, E.C., to hear an account of the winding up from the liquidator, Mr. C. A. Firth.

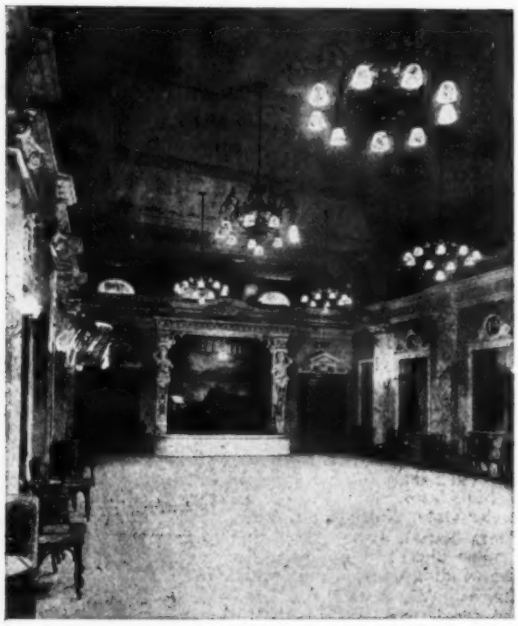
BRITISH EMPIRE EXHIBITION (1924), INCORP.—Winding up voluntarily. Liquidators, the Rt. Hon. J. H. Thomas, M.P., Sir J. A. Cooper, and Sir A. F. Whitney, 4b, Frederick's Place, Old Jewry, E.C. Meeting of creditors was called for November 26th, at Winchester House, Old Broad Street, E.C.

Private Arrangements.—PETER CURTIS, LTD., 75a, Camden Road, N.W., manufacturing electrical and wireless engineers.—As briefly reported in our last issue, a meeting of creditors was held on November 16th. A statement of affairs as at October 31st was presented, which showed liabilities of £16,190; the Paragon Rubber Co., Ltd., after deduction of debenture charge, was a creditor for £9,871. The net assets were valued at £757, leaving a deficiency, subject to the costs of winding up, amounting to £15,433. The company was incorporated in October, 1923, for the purpose of manufacturing and selling radio apparatus. Certain assets were purchased for cash amounting to £75. The subscribed capital was £100. In October, 1924, the capital was increased to £4,000. One of the directors, Mr. Forbes, drew £5 per week, but that remuneration was increased to £1,000 per annum. As from July, 1925, Mr. Forbes had voluntarily reduced his remuneration to £750 per year. In January, 1925, Mr. Forbes sold to the company a new high-frequency amplifier for £750, and took shares in the company for that amount. The Paragon Rubber Co. became large creditors, and subsequently Mr. A. E. Blackwell was appointed a director of Peter Curtis, Ltd., in the capacity of advisory manager. A floating charge was given to the Paragon Rubber Co. for £5,000. The chairman said he had no reason to doubt that the debenture was in every way valid. Continuing, he said that for the two years up to October 31st, 1925, there had been a loss of something like £1,100. That loss was attributed largely to the fact that the directors had found a general difficulty in launching a new organisation and during the period 1924-25 the company was left with heavy stock which had to be sold at unremunerative prices. The advances made by the Paragon Rubber Co. amounted at one time to something like £14,000, but it was unwilling to take advantage of the debenture. A meeting of the larger creditors had been held previously and the statement of affairs had been

placed before them. The chairman said that the directors had reason to expect that the company could in the future be conducted without loss. Mr. Latham proposed that, subject to all goods ordered subsequent to October 10th being paid for in cash, the creditors should accept an offer of 4s. in the £ payable not later than December 15th. The resolution was carried.

The Brazilian Electrical Market.—The United States Assistant Trade Commissioner at Rio de Janeiro, reporting at the end of last month, stated that electrical equipment sales in Brazil had fallen off considerably, only financially strong houses being able to buy. The market for radio equipment was "dead" after an exceedingly good month. The Sao Paulo power shortage would show improvement shortly owing to half of the Rasgao works being completed and the other half nearly ready.

Illuminated Assembly Rooms.—The accompanying illustration depicts a good example of modern ballroom lighting which is installed in the Star and Garter Assembly Rooms, Putney Bridge. The main illumination is effected by a number of artistic electroliers, while it is augmented by brackets



The Star & Garter Assembly Rooms.

fixed at frequent intervals on the walls. "Osram" gasfilled lamps in tangerine-coloured shades are used throughout. Over the stage, seen in the background, is a searchlight projector which is equipped with a rotary disk containing colour screens. The installation was carried out by Messrs. Tillotson, Fulham.

Siemens-Schuckert in Uruguay.—Siemens-Schuckert, of Germany, has applied for articles of incorporation in Uruguay for the purpose of opening a branch house in Montevideo under the name of Compania Platense de Electricidad Siemens-Schuckert. This action is being taken to obtain a more favourable position in supplying the growing demand for electrical supplies and equipment in Uruguay and for greater convenience in submitting bids on the numerous public tenders called for by Government and private institutions.—*Commerce Reports.*

The United States Electrical Export Trade.—Mr. Julius Klein, director of the U.S. Bureau of Foreign and Domestic Commerce, in the course of a recent address said:—"The United States is to-day the largest exporter of electrical goods, and its position is not seriously threatened. Before the war Germany led the world and supplied almost half of the total shipped by the five leading electrical manufacturing countries. The astounding advancement in technique in that industry in the United States and the tremendous domestic demand for its output are undoubtedly the two explanations of the position attained in our exports of this type."

Electric Furnace Orders.—Orders for its furnaces have recently been received by AUTOMATIC & ELECTRIC FURNACES, LTD., from the Isotta Fraschini Fabbrica Automobili, Milan; the S.A. Tronvay et Cauvin, Paris; the Hans Keise A.G., Berlin; the L.C.C. Tramways Dept.; Henry Lane (Australia), Ltd., Newcastle, N.S.W., and a number of other British and foreign concerns.

German Foreign Electrical Trade.—Exports of electrical goods from Germany during the first six months of 1925 totalled 142,500,000 marks, as compared with 259,200,000 marks for the entire year 1924 and 290,300,000 marks for 1913. From January to June, inclusive, 1925, imports of these manufactures into Germany reached 8,400,000 marks, as against 9,100,000 marks in 1924 and 12,800,000 marks in 1913.—*Commerce Reports.*

For Sale.—Mr. H. J. Shaw will offer by auction on December 1st, at 85, Newington Causeway, S.E., various trade stocks of electrical and wireless manufactured goods and material. Messrs. Fuller, Horsey, Sons & Cassell will sell by auction at Church Wharf, Chiswick, on December 2nd, electric motors, circuit breakers, switchgear, &c. (See our advertisement pages to-day.)

A Report upon the British West Indies.—Mr. J. L. Wilson Goode, Trade Commissioner for the British West Indies, &c., has furnished the Department of Overseas Trade with a report upon the economic and financial conditions in his area. (Stationery Office, 2s. net.) Mr. Goode mentions a number of public works contracts which have been awarded, including one in connection with the Hermitage reservoir and hydro-electric works (Jamaica) which was let to a British firm for £149,978. Tenders are shortly to be invited for the remainder of the work. In British Honduras it is intended to recondition the Belize electric light and ice plant at an approximate cost of £20,800. The imports of electrical goods into Barbados, British Guiana, Trinidad and Tobago, and Jamaica aggregated £56,039 in 1924, as compared with £71,533 in 1923. The bulk of this business (£44,832 in 1923 and £34,823 in 1924) was secured by the United States. Great Britain supplied goods to the value of £22,598 in 1923, and £16,047 in 1924. It is stated that American influence gained considerable ground during the war, and although in many important lines the United Kingdom has since recaptured its trade, the predominance of American productions over a period of years has left an enduring mark. In certain lines German competition is increasing, and electrical goods are specially mentioned. German travellers are commencing to canvass these markets, and it is probable that German activities in this direction will increase.

Trade Marks in Argentina.—*British Industries* (the official organ of the F.B.I.), calls attention to the importance of maintaining a close watch upon trade mark interests in Argentina. It states that registration should be applied for and secured before any attempt is made to export goods to that country, and special care should be taken to renew the registration every ten years. The applications published in the *Boletin Oficial* should be watched by the local agents to guard against the registration of infringing marks.

Swiss Tariff Increases.—The *Board of Trade Journal* for November 19th published a list of articles which are to be subject to increased import duties upon entering Switzerland. Some duties are to come into force upon a date to be fixed, while others will probably be only used as instruments for obtaining concessions from other countries. The list includes the following items:—Insulated lead-sheathed cables; dynamo-electric machines and transformers; automobiles, including electric cars; accumulators and plates; electrical measuring instruments; and telegraphic and telephonic apparatus.

Radio in Canada and the United States.—We have received a copy of a report prepared by Mr. W. A. Brooke, sales director of the Ashley Wireless Telephone Co., after a tour of Canada and the United States. Mr. Ashley says that an approximate analysis of radio apparatus used in Canada shows that it is about 90 per cent. American, Great Britain merely sharing in the balance. There is a preference for British goods provided that the price is reasonably competitive, and good sales of the Ashley Company's products were effected against American and Canadian competition. Canadians appear to depend mainly upon American broadcast-

British Radio Apparatus at Montreal.

ing for their entertainment; the Dominion stations do not operate regularly. Both American and Canadian broadcasting is inferior in quality of transmission and standard of programme to British broadcasting. There is still no sign of "saturation" of the American radio market. All the factories visited were working at full pressure, producing an astounding quantity of apparatus. American radio components of the better class are superior to the average comparable British product; this is attributed to the opportunities for mass production. The accompanying illustration shows a stand arranged by the Ashley Wireless Telephone Co. at a Montreal radio exhibition.

Spanish-German Agreement.—The "tariff war" between Spain and Germany, which was expected to be of benefit to traders of other countries, has been brought to a swift end by the signing of a *modus vivendi* for six months.

Argentina's Electrical Imports.—During the first half of the current year the tariff value of electrical goods imported into Argentina was 324,828,212 gold pesos, as compared with 278,743,353 pesos in the first six months of 1924.

Book Notices.—"Hütte, des Ingenieurs Taschenbuch." Edited by the Akademischen Verein Hütte, E.V., 25th edition, Vol. I. Pp. xvi+1,080; illustrated. Berlin: Wilhelm Ernst and Sohn. Price 13.20 Rmk.—This publication, originally issued in 1857, has been brought up to date, and contains many new sections. Its contents embrace mathematics, technical physics, properties of materials, measurements, surveying, &c.; in this volume only casual references to electrical matters occur, but there is a vast amount of general information on engineering subjects, with numerous tables and diagrams. There are three other volumes in the series, which constitutes in condensed form an encyclopædia of engineering. The volume is clearly printed in Roman type, with excellent illustrations, and is provided with a very full index.

"*Journal* of the Institution of Electrical Engineers." Vol. LXIII. No. 347. November, 1925, and Index to Vol. LXIII. London: E. & F. N. Spon, Ltd. Price 10s. 6d.

"*Journal* of the American Institute of Electrical Engineers." Vol. XLIV. No. 11. November, 1925. New York: The Institute. Price $1.

"Electrical Power and National Progress," by H. Quigley. Pp. xii+160; figs. 18. London: G. Allen & Unwin, Ltd. Price 8s. 6d. net.

"Electrical Engineering Problems." Part 1. "Direct Current Circuits and Apparatus," by J. G. Pertsch, jun. Pp. viii+213; figs. 100. London: McGraw-Hill Publishing Co., Ltd. Price 10s.

"Elementary Electrical Technology," by A. M. Parkinson. Pp. x+179; figs. 130. London: Oxford University Press. Price 6s.

"Artificial Sunlight," 2; Special Report of the Public Health Department of the Metropolitan Borough of Poplar. October, 1925.—This publication is issued as a supplement to the special report of the Department, August, 1925, "Practical Artificial Light Treatment." It contains a description of the "U-V-Scope," a simple portable photometer for gauging the intensity of ultra-violet rays.

"Technologic Papers of the U.S.A. Bureau of Standards."—Vol. 19, No. 290, July, 1925 (30 cents); No. 295, August, 1925 (10 cents).

"Scientific Papers of the Bureau of Standards," Vol. 20, No. 511, August, 1925. Price, 15 cents.

"High Vacuum Surface Condensers," by D. T. McHutchison. The Technical Section, Association of Engineering and Shipbuilding Draughtsmen. Price 2s.—The factors affecting the rate of heat transmission in a surface condenser are fully discussed and supported by curves. Many diagrammatic illustrations are given.

"The Dynamical Theory of Gases," by J. H. Jeans. Fourth edition. Pp. iv+444; 28 figs. London: Cambridge University Press. Price 30s. net.

Illumination Design Courses.—The ninth illumination design course arranged by the Electric Lamp Manufacturers' Association was held at the North-East Coast Lighting Service Bureau, Newcastle-on-Tyne, from November 23rd to 25th. The tenth took place at the Scottish Bureau, Glasgow, from November 24th to 26th. The programmes of the courses were practically identical, covering the lighting of shops, factories, streets, the home, &c., both from the technical and commercial aspects. The Glasgow Bureau reports that between seven and eight hundred people have already attended lectures and demonstrations there.

At the London Bureau (Savoy Street) lectures have this month been given by members of the staff to meetings of local Chambers of Commerce, the Institution of Electrical Engineers, the National Association of Supervising Electricians, the Electrical Wholesalers' Federation, and other bodies.

Trade Opportunities in Spain.—The British Chamber of Commerce for Spain has informed *The Times* that in view of the difficulties imposed by Germany on imports of fruit from Spain, commercial relations between these countries have been broken off. Spain as a result has totally prohibited imports of German goods into the Canaries and her North African ports, while imports into the Peninsula and the Balearic Isles are to pay duties under the first column of the Spanish tariff, 50 per cent. British exporters, the Chamber states, would do well to avail themselves of the opportunities offered during this tariff war.

Electric Mine Locomotives in Russia.—The Westinghouse Electric International Co., of East Pittsburgh, U.S.A., has received an order from the Amtorg Trading Corporation, the commercial representatives of the Soviet Government in America, for 25 mine locomotives to be used in connection with the electrification of the coal mines in the Donetz district. A distinctive feature of the locomotives is that they will have adjustable wheel bases so that they can be operated on tracks from 24 to 30 inches in width.

Russian Electrical Manufactures. — A message from Leningrad says that two 8,500-kW generators and 6,000-kW transformers, the first of their kind constructed in the Soviet Union, have been turned out for the Volkovstroi concern by the Elektro Trust works. According to Swedish engineers working for the Volkovstroi, the new Russian generators and transformers approach in excellence Swedish and British makes.—*Reuter's Trade Service* (Moscow).

Irish Free State Electrical Imports.—The Irish Free State Ministry of Industry and Commerce has now issued detailed figures of imports for the first six months of 1925 as compared with the corresponding period of last year. From these we have compiled the appended table, showing the value of the total imports of electrical machinery and apparatus into the Free State and the amount attributed to the United Kingdom as country of shipment but not necessarily of manufacture:—

	Total. January to June.		U.K. Share. January to June.	
	1925. £	1924. £	1925. £	1924. £
Electric wires and cables	51,516	33,733	42,209	28,786
Teleg. and telephone instruments and apparatus	16,956	20,029	16,769	19,925
Electric lamps and parts	22,830	21,562	22,443	20,152
Batteries and accumulators	12,429	9,749	11,751	9,038
Radio sets and parts ...	23,035	69,337	22,373	68,094
Other electrical goods and apparatus ...	32,378	62,493	30,599	60,180
Electric generators ...	6,445	4,058	6,050	3,920
Electric motors	13,549	8,942	13,353	8,520
Other electrical machinery	33,591	19,491	32,013	18,452
Total	£212,729	£249,394	£197,560	£237,067

It will be seen that while wide variations are shown in the different classes of goods, the 1925 imports show a drop of £36,665 as compared with those of last year. All but £15,169 of the goods came from the United Kingdom, and of the balance £8,628 is attributed to Belgium, £3,724 to Germany, and £2,817 to "other countries."

The French Electrical Industry.—In the course of an article contributed to *Commerce Reports*, the United States Consul at Paris says that the amount of new capital invested in the French electrical industry up to September this year was $1,154,500,000 fr. as compared with 764,000,000 fr. for the whole of 1924. The bulk of this (875,500,000 fr.) was absorbed by electricity supply companies, while manufacturing firms took 153,200,000 fr.

The German Electrical Industry.—According to statements made by the price bureau of the Central Union of the German Electrotechnical Industry, the increase in the prices for manufactures which took place in July was made on the advice of the bureau and not on a decision arrived at by the bureau. Previous to this advance the competition which obtained had resulted in great losses. If it is assumed that the electrical industry had a turnover of from 500 to 800 millions of marks in 1924 and the loss through the reduction in prices in that year is taken at from 10 to 12 per cent., the lower receipts amounted to 80 millions. At present 87 firms belong to the price bureau as compared with 90 a year ago, and the bureau is of the unanimous opinion that if a further improvement of about 10 per cent. in current prices could be obtained with the same turnover, the works would be relieved of anxiety concerning the raising of funds for renewals and the production of reasonable balance sheets.

The report of the Electricity Company (late Lahmeyer) of Frankfort-on-Main, states that the expectation that with the return of regular currency conditions the electricity and tramway undertakings would also make an upward movement had in general been fulfilled, as most of the undertakings had been able to pay a dividend for the past year. It would, however, be wrong to assume from this circumstance that all the difficulties experienced by those concerns had been overcome. Their reserve funds had either been lost or were no longer available for use. Besides works of renewal, extensions were necessary and capital was required. The constructional departments of the company have been well employed and an abundance of orders is also on hand for the current year. The net profits for 1924-25 amounted to 1,610,000 marks and a dividend at the rate of 8 per cent. is proposed on the ordinary shares.

The Rhenish-Westphalian Electricity Works Company, of Essen, whose intention to pay a dividend at the rate of 8 per cent. out of net profits of 12,030,000 marks in 1924-25 has already been reported, states that the sales amounted to 1,099.47 million kWh hours as compared with 696.38 millions in 1923-24, although the latter year suffered from the effects of the occupation of the Ruhr. Nevertheless, the increase last year was still 11 per cent. over the maximum, which was attained in 1922-23. The present capacity of the works is 475,000 kW, and to meet the growing demand the cables were extended and now comprise about 620 miles of 100,000-V conductors with nearly a further 100 miles in course of construction. The company is introducing 220,000-V lines, and is linking up with the power station of the Mayence Company at Hochst near Frankfort-on-Main.

New Belgian Companies.—The Société Industrielle et Commerciale Electro-Mécanique S.A. ("Sicem") has been formed at Ostend with a capital of three million francs to deal in electrical apparatus, to construct tramway systems, power and transmission works, &c.

The Union Electrotechnique is the name of a company recently formed in Molenbeek-St. Jean, with a capital of one million francs, to manufacture and deal in all classes of electrical apparatus, but more especially ventilators, bells and meters.

The Austrian Radio Market.—Broadcasting has become very popular in Austria, but the radio apparatus business recently experienced trouble owing to the over-estimation of the demand which sprang up with the commencement of broadcasting, resulting in dealers being left with large stocks. A good deal of apparatus is imported in spite of the fact that there are a number of Austrian manufacturers, and equipment is even exported to Czecho-Slovakia, the Balkans, and Poland.

Electricity Supply in the United States.—A review of American industry published in *Commerce Reports* recently shows that the electric power industry has made remarkable progress in the last three years. As an index the position in 1919 is given as 100 and on this basis the industry reached 136 in 1922-23 rising to 148 in 1923-24, and to 158 in 1924-25. Only one branch of industry has developed to a greater extent, *i.e.*, the "five and ten cent store" business.

British Goods Campaign.—The Federation of British Industries has written to the Government urging the desirability of a campaign for promoting the sale of British goods. One of the suggestions is that the Government should allot a definite fund sufficient to run an extensive advertisement and publicity campaign on a national scale for at least two years, by means of newspaper advertisement, poster and other publicity. Every effort it is suggested should be made to encourage and where necessary co-ordinate with this central campaign, campaigns for their particular products by individual trades and individual industrial centres. The subject is one possessing special interest when we are at the beginning of the great shopping period of Christmas-time.

Locomotive Depôt Improvements.—Improvements involving an expenditure of £43,000 are to be made at the Whitemoor locomotive depôt of the London & North-Eastern Railway. Among the new plant which will be installed is an electro-mechanical coal-handling equipment.

Lighting and Power Notes.

Australia.—NEW SOUTH WALES.—According to the *Industrial Australian and Mining Standard*, the New South Wales Ministry has now definitely decided to abandon the Jackadgery hydro-electric proposal. The scheme to harness the waters of the Shoalhaven River to provide power for the south-eastern portion of New South Wales is to be pushed forward. Mr. Carter, engineer of the Public Works Department, has made a report, in which it is estimated that the scheme would involve an expenditure of about £1,679,000, and would make available 50,000 h.p. Constructional work would extend over about ten years. The Shoalhaven scheme would form a connection between the Burrinjuck and Port Kembla schemes. It is anticipated that the initial stage of the work to serve Goulburn and the Federal capital with power would be completed within three years, and would cost £504,000.

VICTORIA.—The Victorian Electricity Commission has now completed two years' operations in the western district of the State. The main transmission line from Geelong to Warrnambool is 116 miles long, and operates at 44,000 V. The supplementary h.p. lines, which serve towns off the main route, spread over 123 miles, and are operated on 6,600 V and the l.p. recticulation accounts for 103 miles of lines. Of the total of 324 miles, 49 miles of 6,600 V and 284 miles of reticulation were put into operation during the last year.

Canada.—ELECTRICAL DEVELOPMENT.—The *Financial Times* states that the Quebec Power Co., according to Montreal advices, has purchased the Laurentian Power Co., which owned in fee simple the water power at Seven Falls on the St. Maurice River, 35 miles from Quebec, with a total plant capacity of 18,000 h.p. Provision has been made at this plant for the addition of another set of 6,000 h.p.

China.—ELECTRICAL DEVELOPMENT.—According to the recently-issued report of the Société Indo-Chinoise d'Electricité, the central electricity supply stations at Hanoi and Haiphong are making steady progress. In the first-named plant a new 1,500-kW generating set is being installed. A concession covering 20 years has been concluded with the Hanoi authorities. At Haiphong the company has acquired the steam-operated station which formerly belonged to the Société Industrielles de Chimie d'Extrême Orient, and a new engine and generator are to be added. The Indo-Chinese Co. is also establishing a power station in the town of Nam-Dinh, which is expected to be ready for operation early next year.

Continental.—CZECHO-SLOVAKIA.—*British Industries* states that the first stage in the electrification of Bohemia is nearing completion, and it is expected that the new power station at Ervenice, about 70 miles from Prague, will be put into operation in a month's time. The enterprise is under the joint ownership of the Czecho-Slovak Government, the Province of Bohemia and the Municipality of Prague. The programme of electrification, which has been spread over a number of years, also comprises a gradual change from steam to electric power at the Wilson station at Prague and on some of the lines in the vicinity of the capital. The erection of a hydro-electric station on the River Moldau near Prague is to be taken in hand in the early part of next year.

BELGIUM.—The Cockerill Co., of Seraing, the largest industrial undertaking in Belgium, has recently added an 8,000-h.p. gas engine and generator to its electric power plant, bringing the total capacity up to 37,000 h.p. During the past year the output of the various plants increased from 85 to 96 million kWh.

FRANCE.—A concession has been secured by the Société d'Energie Electrique du Tarn to establish h.p. overhead transmission lines between the hydro-electric stations which the company is establishing on the river Tarn between Courris and Truel, and the steam-operated station of the Compagnie Générale Industrielle at Carmaux. The lines will transmit energy at 60,000 V.

BULGARIA.—The Société d'Electricité de Sofia et Bulgarie is increasing its capital with the object of extending its operations. At present the company owns a hydro-electric station at Pantcharevo, about 10 miles from Sofia, and a steam-operated station in the city itself. These having become insufficient to meet the growing demand, it has been decided to erect a new plant about six miles from Sofia with an initial capacity of 18,000 kW. The energy will be transmitted to the city at a pressure of 35,000 V.

Cuba.—ELECTRICAL DEVELOPMENT.—A company has been formed at Habana with a capital of $2,000,000 to construct an electrical installation which will utilise certain waterfalls and supply electrical energy to a number of industrial concerns and railways.—*Reuter's Trade Service* (Habana).

Dolgarrog.—ELECTRICITY SUPPLY RESTORED.—The electricity supply for the whole of the area served by the North Wales Power Company is now fully restored. One of the 5,000-kW hydro-electric generators in the new power house at Dolgarrog was started up on November 16th and the 1,200-kW machine in the old power house is also running.

Glasgow.—ELECTRICAL PROGRESS.—The Corporation Electricity Department reports that twice within the past few days fog has been responsible for establishing new records in output. The previous record, 1,000,000 kWh in one day, has been exceeded on two occasions, while the record maximum demand of 88,000 kW has also been established.

Ibstock (Leicestershire).—ELECTRICITY SUPPLY.—It is understood that the Leicestershire and Warwickshire Electric Power Company has purchased a site in Ibstock for the erection of a transformer station. Many of the business premises and residences in the district have been wired for an electricity supply.

Lanark.—NEW SUB-STATION.—The Clyde Valley Electrical Power Co. is to erect a sub-station with a view to providing an electricity supply for the town.

Leeds.—ELECTRICITY *v.* GAS.—In connection with the erection of houses on the Corporation housing estates, the Improvement Committee has instructed the city engineer to prepare plans for nearly 100 houses, to be fitted exclusively with electricity, or gas. Each house will contain only one open fire, the object of the scheme being to reduce the smoke nuisance. The plan is to establish "all-electric" or "all-gas" colonies, in which not only the houses, but the streets also, will be served exclusively with one system or the other.

Lichfield.—ELECTRICITY AGREEMENT.—The agreement for the supply of electricity in bulk by the Walsall Corporation to the City Council has been completed and orders have been given for the necessary mains and sub-station equipment.

London.—BERMONDSEY.—The Borough Council has received sanction to a loan of £8,026 for mains extensions, services, and meters.

Loughborough.—WIRING OF SMALL HOUSES.—The electrical engineer has been instructed to prepare a scheme for assisted wiring in the borough and to report to the Council.

Louth.—ELECTRICITY SUPPLY.—The Town Council has received a proposal for a supply of electricity from Grimsby. It is proposed to lay the cables along the railway and to supply intermediate villages with electricity.

Millom.—ELECTRICITY SUPPLY.—Reporting on his interview with the Electricity Commissioners, the engineer for the electricity scheme stated that no objections were raised to the scheme, with the exception that the Commissioners questioned the ability of the Council to raise the necessary loan. The engineer did not consider that there would be any difficulty in that respect, and suggested that the Council should write the Commissioners for their consent to the scheme and ask for the co-operation of the local M.P.

Nantwich.—ELECTRICITY AGREEMENT.—It is reported that the Electricity Distribution of North Wales and District, Ltd., and the Urban District Council have come to terms in connection with a scheme for providing an electricity supply for the town.

Northern Ireland.—CARNLOUGH (CO. ANTRIM).—At a recent meeting of the ratepayers, a committee was appointed to make the necessary arrangements for obtaining an electricity supply for the town.

Paisley.—YEAR'S WORKING.—The report on the working of the Corporation electricity undertaking (engineer, Mr. W. Blair Smith) for the year ended May 15th last, shows a total income of £92,108, as compared with £89,836. The working expenses amounted to £53,808, as against £51,206, leaving a gross profit of £38,299 (£38,630), to which was added a balance in hand at the beginning of the year of £7,298, making a total of £45,597 available. This was disposed of as follows: Loan and other charges, £35,235; transferred to reserve, £6,000; balance carried forward, £4,362. The capital expenditure during the year, which included £9,730 for mains, and £7,882 for transformers, &c., amounted to £26,221. The sales of elec-

trical energy increased from 9,236,623 to 10,605,733 kWh, and the maximum supply demanded rose from 5,000 to 5,390 kW. The 6,000-V, 3-phase e.h.p. ring main feeder was completed and put into operation during the year, and a commencement was made upon large extensions of electric street lighting in the town.

Romsey (Hants.).—ELECTRICITY AGREEMENT.—The Town Council has sealed an agreement for an electricity scheme with Christy Bros. & Co., Ltd.

Rugby.—PRICE REDUCTIONS.—The Urban District Council is to reduce the charges for electricity for heating and cooking from 2d. to 1½d. per kWh.

South Africa.—CAPE TOWN.—An agreement has been entered into between the Corporation and the Tramways Co. for the Corporation to supply the whole of the company's requirements of electrical energy for a period of ten years from January 1st, 1927. The price per kWh for the first five years is to be 1.0625d. measured on the d.c. bus bars at the different converter sub-stations. For the remaining period the price is to be reduced by a figure representing any decrease in the total cost of generation. An annual consumption of 4,750,000 kWh is to be taken or paid for. The anticipated revenue to be received for this supply is approximately £24,000 per annum and the capital expenditure for converters, switchgear and h.p. cable connections will be about £20,000.

South-East Lancs. Electricity Advisory Board.—The Board has considered the proposal for a bulk supply of electricity to Eccles Corporation from Salford Corporation and has recommended to the Electricity Commissioners that the proposed contract between Salford and Eccles be approved.

A communication has been received from Wilmslow Urban District Council protesting against the electricity charges made by the Alderley and Wilmslow Electric Supply, Ltd., and the Board has passed a resolution that the Engineering Advisory Committee be instructed to investigate the question of supply in the area served by the company with a view to recommending the adoption of any course which would improve and cheapen the supply in the area.

Stockport.—ELECTRICITY IN BULK.—The New Mills and Marple Urban District Councils have concluded separate agreements with the Corporation for a bulk supply of electricity to their districts.

Sunderland.—ELECTRICITY SUPPLY.—The Sunderland Bridge Council has decided, at the request of the Rural District Council, to be represented at a conference of several authorities to discuss the question of purchasing electricity in bulk and distributing it at a cheaper rate and under better conditions than at present.

United States.—HYDRO-ELECTRIC DEVELOPMENT.—The *Electrical World* states that the first unit of the Yonah hydro-electric plant, fourth in a series of six power developments planned for the Tallulah, Chattooga, and Tugalo River system of the Georgia Railway and Power Co., was recently put into service. The set has a capacity of 12,500 h.p. The dam is 70 ft. high and 900 ft. long. The power house, when completed, will contain three units with a combined capacity of 25,000 kW. The other two units will, it is anticipated, be ready by January 1st. Two more developments will be started as soon as the Yonah plant is completed. They are the Nacoochee project, which will be at the head of Lake Rabun, and the Burton project, which will be at the foot of Lake Burton. The two will add 16,500 h.p. to that already developed and will bring the total power of the system up to 279,500 h.p. The new plant will supply energy to Atlanta and other cities, and energy will be transmitted at 110,000 V.

Whitchurch.—ELECTRICITY SUPPLY.—The Rural District Council has decided to support an application by the Whitchurch Gas Co. for an Order to supply electricity in the rural area.

Wirral.—INQUIRY.—The scheme for the electrification of the Wirral Peninsular, the first part of which will cost £110,000, formed the subject of an inquiry which occupied three days (November 17th, 18th, and 19th) at Birkenhead. The inquiry was conducted by Colonel T. C. Ekin, Chief-Inspector to the Electricity Commissioners. Mr. Craig Henderson, for the Wirral Council, said the Council wanted to borrow £110,000 for its electricity undertaking. It had obtained leave from the L.M. & S. Railway Co. to lay mains along the line of the railway as far as Meols. A supply would also be taken from the Mersey Power Co.'s station at Ellesmere Port. The Wallasey main would be for 6,600 V, and the one from Ellesmere Port 33,000 V. Mr. C. R. St. John (engineer to the scheme) said that there were about 1,000 houses already wired for lighting in the area.

Mr. Burton T. Hawkins, electrical engineer, Wallasey Corporation, stated that his Council objected to Moreton being supplied with electricity from Birkenhead. The Wallasey Corporation had entered into an agreement with the Wirral Council to afford it a bulk supply. Mr. J. E. Nelson (electrical engineer, Mersey Power Co.) said that his company had entered into an agreement with the Wirral R.D.C. to supply electricity in bulk. Mr. Wooll, for the Wirral Ratepayers' Association and the Parish Councils of Willaston and Hooton, said that the scheme was unreliable and extravagant, and was beyond the financial resources of the district.

Mr. G. P. Shallcross, electrical engineer of Birkenhead Corporation, said he had prepared a scheme to supply the Wirral, providing for 12 miles of overhead feeders, 3¼ miles of underground lines, and 14 miles of l.p. mains, with six sub-stations. The total expenditure was about £60,000.

Mr. W. H. Jones, chairman Heswall Parish Council, said his Council would support the Birkenhead scheme. Mr. F. Clarke, Chairman of the Executive Committee of the Ratepayers' Association, stated that eleven parishes had passed resolutions rejecting the Wirral scheme.

Mr. Wooll claimed that the Wirral Council's scheme was not as cheap or as efficient as that offered by Birkenhead. The inquiry was concluded.

Worcester.—NEW PLANT.—The Electricity Committee has recommended to the City Council that a new 6,000-kW turbo-alternator be installed at the Hylton Road works, at an estimated cost of £47,700. The proposal has been referred to the Finance Committee for consideration.

Tramway and Railway Notes.

Australia.—MELBOURNE.—*The Industrial Australian and Mining Standard* reports that the Melbourne and Metropolitan Tramways Board, owing to a variety of reasons, has suffered a severe loss in its transactions during the past year. Mr. A. D. Murdoch, the general manager, in giving evidence before the Arbitration Court, stated that for the two years 1923-1924 the net revenue had decreased from £471,176 to £282,203, and the surplus of £8,862 in 1923 became a loss of £125,465 in 1924; while for the last financial year the loss had increased to £232,000. Mr. Murdoch gave, as reasons for the serious loss sustained by the Board, severe motor-'bus competition, a fortnight's strike, and the great increase in privately-owned motor vehicles.

Consideration has been given by the Victorian State Cabinet to the future control of the metropolitan tramways. A suggestion has been made that when the term of the present Melbourne and Metropolitan Tramways Board expires the board should be abolished, and that in its place there should be established a board consisting of three experts in tramway matters. Other proposals which have been made are that the control of the tramways should be transferred to the Railways Commissioners, or that the board should be enlarged to embrace more direct municipal representation.

SYDNEY (N.S.W.).—The eastern section of the Sydney city railway will be opened for traffic in July next year. The structural work of the St. James' and Museum stations is nearly complete, Devonshire Street subway alterations are in hand, and the surface work between Devonshire Street subway and Cleveland Street bridge is in progress. The expenditure on the work up to July last was £2,340,100.

Continental.—SPAIN.—The Sol-Quevador section of the Alphonse XIII underground electric railway in Madrid has recently been completed and opened for traffic. The line is an extension of the Sol-Venta section, the two forming a railway which runs from the east to the west of the city, a distance of nearly four miles.

SWEDEN.—Successful trial runs with electric goods trains took place on October 13th on the Moholm-Falkoping section of the line between Stockholm and Gothenburg, the electrification of which will soon be completed. Four trains were despatched simultaneously in each direction, the longest consisting of 50 trucks. A fully-loaded train maintained a speed of 37½ m.p.h.

Dover.—LOAN SANCTIONED.—The Town Council has received from the Ministry of Transport sanction to a loan of £7,184 for the reconstruction of the tramway track in Snargate Street, Northampton Street, and Stroud Street.

Glasgow.—THROUGH RUNNING.—According to the *Electric Railway and Tramway Journal*, Mr. Dalrymple, general manager of the Corporation tramway undertaking, is to confer with the manager of the Lanarkshire Tramways Co., on the question of mutual through-running.

Dudley.—LIGHT RAILWAY ORDER.—The Minister has recently made an Order authorising the abandonment of parts of the Dudley and district light railways.

Liverpool.—TRAMWAY IMPROVEMENTS.—In a statement at a recent meeting of the Tramways Committee, Mr. F. C. Wilson said that the new turbine at the Lister Drive power station would probably be put into service within the next two months. Further tramway extensions were contemplated, and new and improved types of tramcars were under consideration.

London.—PROPOSED NEW TUBE.—The Metropolitan Railway Co. proposes to construct a new tube from Baker Street to Kilburn and Willesden Green, and powers to construct it will be sought in the next session of Parliament. The line will be three miles in length and will act as a loop line to deal with the increasing traffic between Baker Street and Uxbridge and Aylesbury. There will probably be new stations at Maida Vale and Kilburn. The cost of the scheme is estimated at £2,000,000.

NEW TUBE CARS.—The Underground Co. has placed orders with Messrs. Cammell, Laird & Co. and the Metropolitan Carriage, Wagon & Finance Co. for 78 new cars required for the Morden and Kennington extensions, which will be ready for service next midsummer.

Walthamstow.—LOAN.—The Urban District Council has applied to the Minister of Transport for sanction to a loan of £98,000 for tramway purposes.

Telegraph and Telephone Notes.

Aircraft Radio.—WAVE-LENGTH.—For wireless communication with aircraft a limited wave-length band in the neighbourhood of 900 metres has been allotted, and while this has sufficed in the past, it is now in danger of being very overcrowded. When, as the *Financial Times* points out, it is considered that the average number of machines arriving at, or departing from, the London terminal aerodrome daily is about 70, and that there are frequently five or more machines within the British control area simultaneously, it is not difficult to understand that interference between machines and ground stations frequently occurs. The problem will be rendered the more acute when, as will possibly take place in the future, facilities are afforded to airway passengers to send private messages in a similar manner to that in vogue on board ship. As a partial solution, a scheme will be tried shortly in which the larger machines will carry an operator who will transmit and receive all his messages by telegraphy instead of telephony. Another aid is being sought in the use of shorter wave-lengths.

Imperial Wireless Committee.—SOUTH AFRICAN AGREEMENT.—The first fruits of the work of the Imperial Wireless Committee, which has been in session since last June, is a "beam" wireless agreement, which was signed on November 19th, between representatives of the British Post Office and the South African Wireless Co. Agreement has been reached on the handling of "beam" traffic in the two countries, and also as to the division of revenue. Stations for communication with South Africa are approaching completion at Bodmin and Bridgewater, whilst a corresponding station is being erected near Cape Town, and it is expected that the stations, which will be under the independent control of the British and South African Governments respectively, will be open for traffic next spring. The rates to be charged in the new service are one-third below the ordinary cable rates.—*Reuter.*

Italy.—TELEPHONE SERVICE.—A Bill dealing with the special assignment of a hundred million lire (about £1,000,000) per annum for six years to provide for the systematising of the inter-urban telephone communication service of the State will shortly be submitted for the approval of the Italian Parliament. The past want of organisation and lack of funds have brought matters to a crisis. The existing plant is quite inadequate for present needs, and renders impossible the necessary facility for telephonic communication over long distances.

Pacific Cable.—DUPLICATION DISPUTE.—The Canadian Postmaster-General, the Hon. Charles Murphy, following the award of £2,250,000 contracts by the Pacific Cable Board for the duplication of the existing "All-Red" cable between Bamfield (Canada) and Fiji, declares that the duplication of the cable was decided on in the absence of the Canadian representatives on the Board, which controls the cable in the joint interests of Great Britain, Canada, Australia, and New Zealand. He adds that the contracts were awarded despite Canada's protests and in defiance of the Imperial Cable Act, which specifically states that no new work can be undertaken without the full concurrence of all the parties concerned. He has recommended his Government to withdraw from partnership in the cable, and urges that a new Imperial Act should be passed to enable Canada to "get her money back."

The contracts were placed last month. The section between Bamfield and Fanning Island, which is 3,458 miles in length and is the longest cable in the world, is being made by the Telegraph Construction and Maintenance Co., of Greenwich, while the section between Fanning Island and Suva (Fiji) is in the hands of Messrs. Siemens Bros., of Woolwich.

The *Daily Express* understands that Mr. Murphy has circulated among members of the Canadian Parliament and members of the Pacific Cable Board a pamphlet setting out his protest against the Board's "illegal and unbusinesslike action." He discloses in a cablegram dispatched to the Board last January his astonishment at receiving notification from Sir William Mercer, the chairman, that the Board had "no intention of consulting any of the Dominion Governments previous to awarding the contracts for the duplication of the cable." Then he claims to have established that:—

1. Tenders which the Board proposed to accept were "unduly high, even in the opinion of the Board's own engineers."
2. Following Canada's representations, the contract price was considerably reduced, comparisons having been made with the cost of laying new cables elsewhere.
3. No investigation was made by the Board into the wireless "beam" system.
4. No consideration was given by the Board to the installation of cables having a greater capacity than the Board's moderate requirement of 600 letters a minute, although recent inventions have given cables practically an unlimited capacity.
5. By providing for the use of a British "covering" material, the Board had indicated its fear of infringing the American "Permalloy" patents, and had actually earmarked £150,000 in the contract price for damages in the event of possible litigation; also that the Board had subsequently paid £107,000 for a licence permitting it to use a new "covering" or "loading," known as "Numetal."

As soon as the award of the contracts was announced, Mr. Murphy cabled Canada's willingness to withdraw from partnership in the cable enterprise and suggested that she should receive her share of the Board's savings. Otherwise, he declared, "more than £600,000 of Canada's money will be spent illegally and in total disregard of her wishes. Unless it is established beyond question that the duplication is an urgent public necessity, Canada would prefer to receive her share of the estimated cost, rather than agree to a disbursement of funds in a manner unpopular to Canada."

Mr. Murphy pointed out that as, apparently, the future prosperity of the Pacific cable was assured—the surplus last year amounted to £167,893—Canada's further assistance was not required. "The main purpose of the cable is to link Great Britain and Australia, and Australia also imposes a substantial terminal charge on every message received, yielding a revenue of about £200,000 a year. Canada has no such commercial interest, and therefore demands payment of her five-eighteenths share in the accumulated reserve."

The Board's reply was that compliance with Canada's wishes would require the passage of another Imperial Act, as it had no power to pay out funds other than for the laying and management of cables. Canada paid no part of the original capital, which the National Debt Commissioners of Great Britain wholly advanced.

Mr. Murphy replied that Canada, having taken no share in the liabilities of the Pacific cable, is not entitled to a share in the assets, and he contends that the Board wrongly assumed that Canada's agreement in 1921 to a duplication of the cable between Honolulu and New Zealand authorised the present expenditure. He asserts that the Board "wrongly pretended" that a letter by one of Canada's representatives on the Board bound Canada to the duplication of the cable from Bamfield to Fiji. He maintains that this letter referred only to the duplication between New Zealand and Fiji.

Russia.—TELEPHONE SERVICE.—With further reference to our recent note announcing the Soviet Government's intention to spend £20,000,000 on raising the telephone service in Russia to modern standards, it is reported that large American electrical companies are to be invited to co-operate in the project. Russia has at present only one telephone to about every 1,160 people; during 1922 the number of telephones in Petrograd decreased from some 40,000 to 8,966, though the population of the city increased by 300,000; while in Moscow, the headquarters of the Soviet, telephones decreased from more than 54,000 to about 25,000, in the face of an increase of population, during the same period, of some 500,000. The Government desires to increase the number of telephones in the country from 120,000 to 1,000,000, linking up the village centres over widely-scattered areas. It is also anxious to establish long-distance communication with Warsaw, Berlin, Paris, and London. It is understood that the International Standard Electric Corporation has informed the Soviet Government that it is not prepared to re-enter Russia until it has been compensated for the confiscation of its plant, which was nationalised by the Government after the revolution. The Government, while making no guarantees, is said to be willing to discuss terms for a reasonable adjustment of the claim.

The Telegraph Service.—SPEED OF TRANSMISSION.—The Post Office is experimenting with German telegraph apparatus, by means of which six separate messages can be sent over one wire at, it is claimed, a speed of 100 words a minute, says *The Times*, which explains that one advantage of the invention is that it can be used over ordinary telephone wires. Different wave-lengths are employed, and thermionic valves are used which set up oscillation. At the receiving end there is a filter which separates the different messages.

Radio Notes.

Broadcasting Committee.—INQUIRY COMMENCED.—The Committee which has been appointed by the Government to inquire into the radio broadcast service met at the House of Lords on November 19th in private. Sir Evelyn Murray, Secretary to the Post Office, presented a statement with reference to the relations of the B.B.C. to the Government and the Press, and was questioned thereon by members of the Committee. On December 3rd and 4th the public will be admitted, when evidence is given by the British Broadcasting Co., Ltd., and the Wireless League.

Ceylon.—NEW STATION.—Experiments have been in progress since the end of September at the wireless station at Colombo, where new continuous-wave plant is in use, to ascertain whether it is possible to establish regular direct wireless communication on a commercial basis between Colombo and Perth, in Western Australia. Communication has been readily established, and the object of the experiments is to discover whether it can be maintained at all hours of the day and night and under all conditions, says *The Times*. The new plant will be used also for broadcasting purposes on an 800-metre wave-length.

New Wave-lengths.—GENEVA RECOMMENDATION.—Severe jamming having been experienced recently by some of the B.B. Co.'s stations, it is understood that the International Wireless Bureau on November 20th advised by cable from Geneva that the following alterations should be made in the wave-lengths of three stations:—Leeds, 346 to 321.5; Edinburgh, 328 to 324.5; Nottingham, 326 to 327.5.

New Studio.—OXFORD.—The new studio which the British Broadcasting Co., Ltd., has opened in Oxford was used for the first time on Monday evening, November 23rd.

(*Continued on page 863.*)

A Modern Electric Heater Manufactory.

The New Works of Messrs. Belling & Co.

WE were recently afforded an opportunity of visiting the new "Bridge Works" at Enfield of Messrs. Belling and Co. These works, which stand on a 10-acre site, are the outcome of the very considerable progress made by the company since its inauguration in 1912. In that year the first "Belling" works were established at Enfield for the exclusive manufacture of electric fires, the original firebar with which all the fires were fitted being patented at that time. The demand for these fires increased so rapidly that larger premises were soon taken over at Edmonton, where the firm commenced the manufacture of other domestic electrical appliances, such as cookers, water heaters, &c. These premises were burnt down and rebuilt and enlarged in 1920, but the expansion of the business made it necessary to build a larger factory on modern lines, and the site at Southbury Road, Enfield, was chosen for this purpose.

Fig. 1.—The New Works.

The new factory, fig. 1, consists of two separate buildings, the larger one, a 6-bay building, the factory proper; and a smaller 3-bay building which is now being equipped as a foundry, in which it is intended to turn out the whole of the castings for the Belling products. The premises are of fireproof construction, built entirely of steel and concrete, with roofing of corrugated asbestos arranged with steel and glass north lights, making it a well naturally-lighted works. The floor area of the factory proper is 23,400 sq. ft., and that of the foundry is 11,700 sq. ft.; it is interesting to note that four new bays are being added to the main shop. The works are laid out on modern lines, the various departments being arranged so as to facilitate the handling of the raw and manufactured materials, and the easy transportation of the products, in their various stages of production, between the departments. The larger building also accommodates the offices, which are arranged along the front of the building.

Fig. 2.—Plating Department.

A central avenue, figs. 3 and 5, down the length of the main shop accommodates the benches and equipment for the assembling of the various parts for both the heating and cooking stoves, each of these products being dealt with by a separate department. The smaller processes of manufacture, such as the winding of the elements and the lacquering and blacking of the frames, &c., are dealt with in surrounding compartments. Nickel chrome element spirals are wound on the special winding machines, fig. 4, which provide horizontal high-speed revolving mandrels on which the wire is turned. A stout wire is used for the elements, and the spirals are mounted on specially-constructed fireclay bars which are prepared by another firm; this work is done on assembling benches near at hand. At the present time the cast frameworks for the various stoves are received from an outside source. On receipt, the castings are first filed down and then dealt with in the blacking room, fig. 6. Here the castings are sprayed by means of compressed air from an electrically-driven compressor, shown on the right of fig. 6, and then baked in electrically-heated ovens. The heating elements in these ovens were installed by Messrs. Belling & Co. When in use the ovens are heated up to a temperature of between 300 and 400 deg. F. After being blacked the frames are conveyed to the central avenue or assembling shops, where they are fitted with the elements, switches, &c.

Fig. 3.—Assembling Benches.

Fig. 4.—Winding and Cutting Machines.

A large proportion of the products of the works is represented by the manufacture of electric fires constructed with light sheet metal frames. These frames are prepared sectionally on special stamping and

cutting guillotine machines, fig. 4. After being assembled they are treated in the blacking department in a similar manner to that in the case of the heavy cast frames. Before assembling in the frames, the element bars are electrically tested separately; and after the stove is built up it is tested as a whole both as regards the elements purely and also for leakage to the frames.

Fig. 5.—Central Avenue.

For the latter tests, a pressure of 1,000 V is flashed across the elements and the frames.

Many attractive designs of light brass and other metal frames are another feature of the works production, and these are treated in the electro-plating department, where any of a number of finishes can be given according to taste. The plating tanks are shown in fig. 2; some of them are electrically heated. Various stores are arranged throughout the factory, situated near where the stored contents are next to be required in the process of manufacture of the stove. In the case of the cooking stoves, the elements for the modern designs are made up as complete units and are not assembled in the frames, &c., until final dispatch, which, pending the completion of a railway siding, is done by road vehicles. A suitable sloped loading platform is provided for this purpose at the main entrance of the large building. Packing rooms are situated near the loading platform, the heavy packing being effected on the same level as the latter. For a water supply, the firm has had a well sunk on the site, from which water is pumped electrically to a 2,000-gallon tank raised on a brick column, fig. 1, to a level approximating that of the factory roof.

The electricity supply for the works is received from the North Metropolitan Electric Power Supply Co. It is metered and distributed in a special switchboard room, a 5-panel slate distribution board being erected for the purpose.

In all of the many designs of electric fires which are now produced at these works is incorporated the "Belling" multi-parabola fire-bar. The heating surface of this bar is made up of 75 small parabolic wells. The heat is generated in the spirals of nickel-chrome wire, which lie in the wells and give off their heat all round. The front of the spiral thus radiates heat direct into the room, while the heat round the back of the spiral is radiated by the wells, which were specially designed with this in view. The fire-bar itself is convex in shape to ensure that the heat radiates out over a wide area, and not merely in one direction only. In addition to being a highly efficient element, a claim made by the makers, the special construction of the multi-parabola fire-bar renders it reliable. The wire is almost entirely protected by being sunk just below the surface of the fireclay; there is thus small risk of the wire becoming broken. The "Corinthian" fire is an excellent example of the attractiveness which is a feature of many of the designs produced by this firm. It is designed particularly for use in the drawing room, and is pleasing in tone, with gracefully curved sides and simple but distinctive ornaments. The frame is sufficiently wide to effectively cover an existing grate without spoiling its general appearance.

Many forms of electric cooking appliances are included in the manufactures of the firm, from the complete cooking range down to the small portable boiling plate. Considerable importance is attached by the company to the question of water heating, and it has produced several sizes of immersion heaters.

Fig. 6.—Blacking and Stoving Room.

The Bradford Electricity Undertaking.

The Inauguration of an Interesting 20,000-kW Generating Set.

THE Bradford Corporation claims to have been the first local authority to utilise powers conferred by Parliament for the public supply of electricity.

The Bolton Road Works were opened in September, 1889, and the Valley Road Works were first commissioned in 1897; they were later extended and the plant was added to from time to time, the first turbine in this station being installed in 1909, and the new plant inaugurated last week completed the change. Thus, turbo-generators of 59,000-kW capacity are now housed in an engine room that was designed in 1900 to accommodate 5,000 kW of reciprocating machinery.

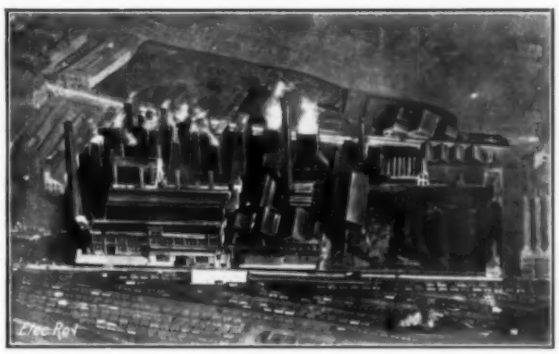


Fig. 1.—Valley Road Works, 1925.

Mr. Thomas Roles, city electrical engineer and manager, gives the total cost of the latest extension as slightly over £100,000, and the new machinery was formally inaugurated on November 18th by Lieut.-Col. W. W. Ashley, Minister of Transport, and Mrs. Ashley, in the presence of Sir John Snell, Chief Electricity Commissioner, and other distinguished guests. Fig. 1 is an aerial view of the generating station.

The new turbine, manufactured by the English Electric Co., Ltd., as will be seen from fig. 2, is a two-cylinder tandem combination, with the impulse elements confined to the h.p. end and the reaction elements to the l.p. end. The latter cylinder is of the double-flow design, and there are two main bearings either side of the h.p. rotor and two main bearings either side of the l.p. rotor. The two turbine and the alternator rotors are coupled together through "English Electric" standard multi-tooth couplings, and each turbine rotor is provided with a Michell double-thrust block housed in the h.p. and intermediate bearings.

The h.p. cylinder has interesting features: the angle of expansion from the first nozzle in front of the first stage to the exit from the last row of blades is very good, and was attained by the employment of an unusually large number of stages for a comparatively small heat drop. The limiting factor in this direction has hitherto been the difficulty of locating sufficient number of stages between adjacent bearings without running through the first critical speed. With the usual construction of built-up rotors with the disks bored in the centre to take the shaft, the hubs of the disks have to be thickened to take the stress concentration with a reasonable factor of safety. This gives a definite minimum pitch between adjacent bearings, if the first critical speed is to be avoided; avoiding the first critical speed by thickening the shaft has distinct limitations because of the attendant increase in h.p. gland losses, and so by cutting the whole of the h.p. rotor from one forging, the English Electric Co. has obtained twelve-stages, figs. 3 and 4, giving a remarkable angle of expansion in an overall length which could only have accommodated a seven stage cylinder of the usual built-up type.

The diameter of the shaft and total weight of the rotor are, in addition, considerably less than could have been realised with the built-up construction, and other features are the unusually small diameter and, consequently, low blade speed. We see here a sharp departure from a practice which has hitherto been almost universal among designers of impulse machines.

This small-diameter, multi-stage construction provides a low-stressed rotor with a uniformly good velo-

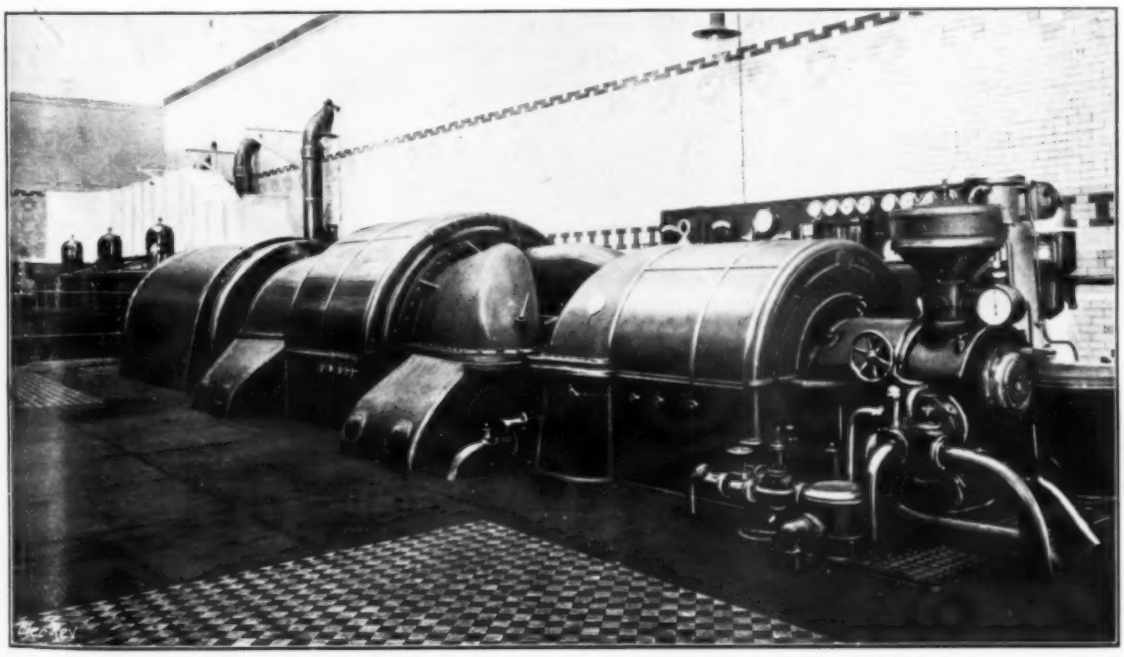


Fig. 2.—The New Two-Cylinder, Impulse-Reaction, 20,000-kW, 3,000-r.p.m. Turbo-generator.

city ratio and circumferential steam admission, and permits a stator casting of exceptionally small proportions, the internal stressing of which is such as to minimise distortion. The division between the cast-steel and cast-iron sections comes after the eighth stage, and thus divides the total cylinder into two very simple castings of small dimensions with a very small temperature drop across each section.

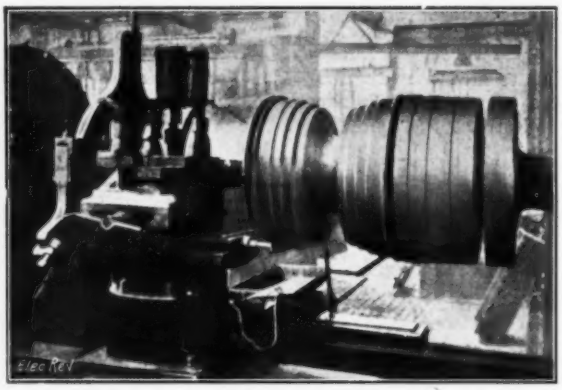


Fig. 3.—Turbine l.p. Rotor being Machined.

This design for the h.p. cylinder represents a bold departure from, indeed, almost a reversal of, those general principles which have until recently governed the design of most impulse machines. While having a blade development and angle of expansion comparable with those of the highest efficiency reaction design, the safety characteristics of an exceedingly low-stressed impulse machine are preserved, and it would appear that the necessity for the usual compromise between safety and efficiency has thus been largely obviated.

exhaust must also assist the running characteristics of the turbine materially.

An annular space between the fourth and fifth rows of the l.p. blades on either side of the centre is an extraction belt for the first stage of regenerative boiler feed water-heating system, the two belts being coupled together by a connecting pipe on the under side of the frame, the extracted steam being taken to a feed heater under the engine room floor. Exhaust steam from the condenser air ejectors and gland drains is used for the second stage.

The turbo-generator, designed for a maximum continuous output of 20,000 kW, has its lowest steam consumption at 16,000 kW, the steam pressure being 190 lb. per sq. in., temperature 659 deg. F., and vacuum 28½ in. A noteworthy feature of the alternator (by Messrs. C. A. Parsons & Co., Ltd.) is its large output at the high speed of 3,000 r.p.m. The peripheral speed has been kept moderate by the adoption of a comparatively long rotor, the over-all length of the alternator and exciter being 22 ft. 8 in., and the outside radius of the stator casing 4 ft. 1¼ in.; it is a 6,600-V, 2,190-A. 50-cycle, 0.8-p.f., totally-enclosed machine.

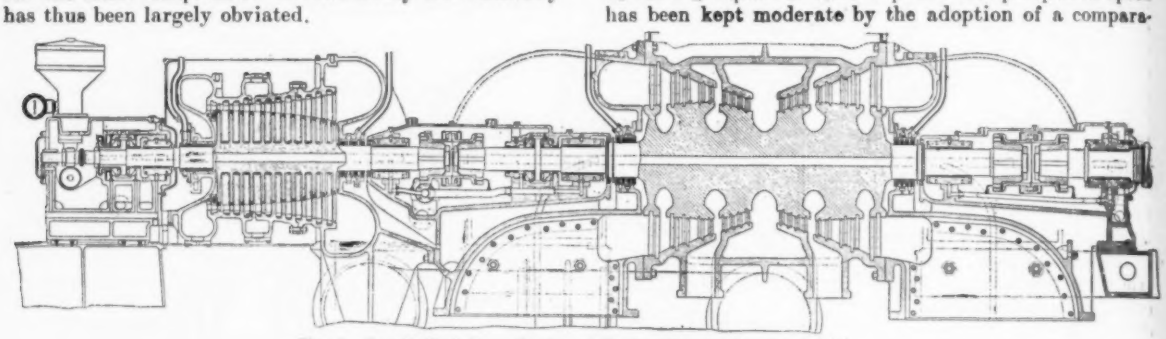


Fig. 4.—Longitudinal Cross Section of Tandem Impulse-Reaction Turbine.

The steam exhausted from the h.p. casing passes through two pipes on either side of the shaft axis, while the large volume of l.p. steam is dealt with on the double-flow reaction principle, passing something like

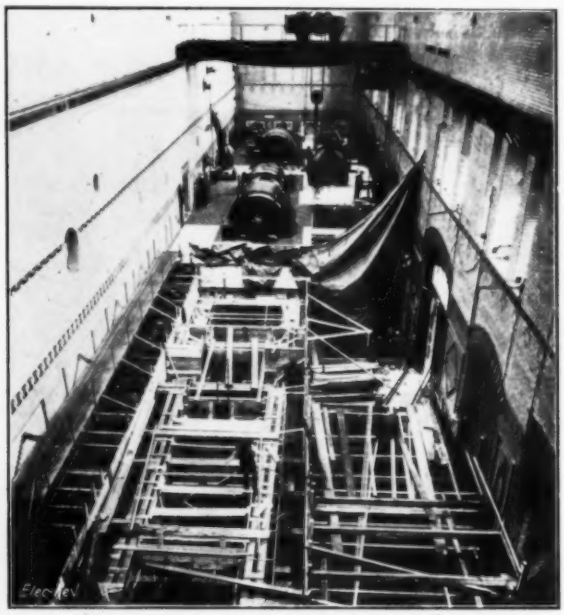


Fig. 5.—Foundations for the New Machines.

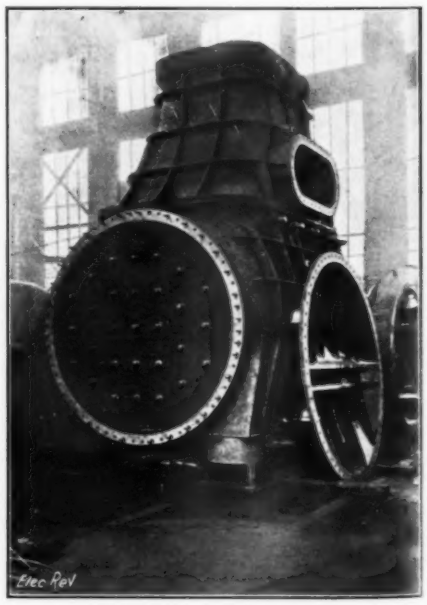


Fig. 6.—One of the Twin Condensers.

200,000 lb. of steam per hour, it being considered sounder practice to divide the steam and thus halve the blade height rather than introduce single-flow devices which necessitate fine clearance where it is least desirable. The balance of end thrust with the double-flow

The stator casing was cast in one piece; no "through" core bolts have been used, and the "tunnel" formation of stator slot has been employed. The core conductors are made of Parsons helically-stranded coreless cable, the individual wires being in-

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sulated and spiralled in a definite lay to reduce eddy currents. Thermocouples were embedded during construction. The rotor was machined from a solid forging, and a hole was trepanned axially through the centre of the shaft to enable the forging to be examined by means of optical instruments. Cool air is admitted along the whole length of the stator on the closed-circuit system of forced ventilation, using a surface air cooler and a separate motor-driven fan.

The twin Cole, Marchent & Morley condensers, one of which is shown in fig. 6, have a cooling surface of 35,000 sq. ft., are interconnected, and the water circulates through the tubes twice, the total quantity being 1,770,000 gallons per hour. Expansion stress is relieved by spring supports under the condensers' feet, and a balance pipe connects the two adapting pieces of the exhaust branches; this pipe is steam-jacketed to ensure that its expansion will be equal to that of the turbine.

Each of the three sets of C.M. & M.-Delas air extractors, two of which suffice for full-load duty, will deal with 120 lb. of air per hour with a steam consumption of 1,000 lb. per hour. Air is extracted from both sides of each condenser shell; the two-stage extractors have convergent-parallel water-jacketed diffuser tubes. Each of the two Mather & Platt condensate extraction pumps suffices for full-load duty; one is driven by a 30-h.p. d.c. motor and the other by an a.c. motor.

The evaporative capacity of the 27 water-tube boilers now in use is 676,000 lb. per hour. The 1923 boiler-house extension contains four Babcock & Wilcox marine type water-tube boilers, each of a maximum evaporative capacity of 81,000 lb. per hour.

(To be concluded.)

Ald. Wilfred Taylor presided over the proceedings generally as the chairman in office during the period of construction of the new set, which has been on load, as a matter of fact, since September. Miss M. D. Turner, daughter of Alderman Turner, presented bouquets to Mrs. Ashley and to the Lady Mayoress of Bradford (Mrs. J. Stringer).

At the Town Hall luncheon Ald. Turner again presided, and Mrs. Ashley was presented, on behalf of the three principal contractors, with a handsome table lamp of beaten silver.

Lt.-Col. Ashley, M.P., Minister of Transport, toasting "The City and Trade of Bradford," asked all manufacturers to support the British Industries Fair. The Lord Mayor of Bradford (Alderman J. Stringer) responded.

Sir John Snell, C.B.E., proposing "The Bradford Electricity Undertaking," said it was gratifying to note that in a time of industrial depression the undertaking was able to manufacture and sell at an average price of little more than 1½d. per kWh. In spite of the fact that the engineer had been handicapped to some extent by the lower steam pressure of older days, the undertaking had been able to maintain an annual thermal efficiency of some 16 per cent., whilst at the best station in the country the thermal efficiency was a little under 20 per cent. At the present moment the average consumption from public utility undertakings per head of population was only some 125 kWh per annum, whereas the sales in Bradford were already about 240 kWh, and the day was near when Bradford would have to consider going further afield in order to have the necessary generating plant to meet the needs of its own citizens. In the efforts for re-organisation in the Aire and Calder Electricity District of West Yorkshire, settlement had not been reached, and he could not help thinking that, had all the authorities concerned shown the same statesmanship and breadth of view as those connected with the Bradford undertaking, that settlement would, in fact, have been reached before now. "I ask again," said the speaker, "at this public opportunity afforded me, all of those parties to whom I have referred, to endeavour once more to come together."

Alderman Wilfred Turner, responding, said that the installation which had been started that day must not be regarded as a sign of latter-day repentance for past misdeeds in Bradford. Three large sets now housed in No. 3 engine room were actually approved by the Bradford Electricity Committee nearly 10 years ago, but war-time difficulties of obtaining plant and difficulties in arranging the removal of older plant without interrupting the continuity of supply had caused the delay.

"The Guests" were toasted by the chairman, and the Lord Mayor of Leeds (Councillor J. Arnott) and the Mayor of Huddersfield (Alderman Law Taylor) responded.

A toast to the "Contractors" was given by Councillor J. W. Longley, chairman of the Bradford Electricity Committee.

Mr. V. Watlington (English Electric Co.), Mr. G. Bedford (C. A. Parsons & Co., Ltd.), and Mr. R. S. Brailsford (Cole, Marchent & Morley, Ltd.) responded.

Councillor J. H. Palin, M.P. (ex-Lord Mayor of Bradford), proposing a toast to the Bradford City Engineer and his staff, presented Mr. T. Roles with a silver salver, the gift of the contractors, in appreciation of their happy association.

Mr. Roles, responding, paid a tribute to the way in which Mr. Townley, the deputy engineer, had carried on during his (Mr. Roles's) illness.

Radio Notes.

(Continued from page 858.)

Hungary.—REGULATIONS.—Possession of wireless receiving sets in Hungary has now been legalised, and regulations governing their use have been issued, says *The Times*.

Sweden.—INTERCONNECTION OF STATIONS.—The Government and private broadcasting stations in Sweden are all now being connected together to the main station in Stockholm, *via* underground or aerial wires. At Stockholm there are amplifiers on each main route, and there are intermediate amplifiers at Ange and Norrköping. To prevent the stations nearest Stockholm taking too much of the power from the lines to the detriment of the stations further away, adjustable resistances are inserted in the feed to each station just before the local amplifiers in the station. The line between Stockholm and Boden is 1,000 kilometres long, in which at present one amplifier suffices, but additional ones will be required when the station at Umea and other projected stations are added. Some 40,000 licences were issued in 1921; 110,000 were issued up to September 30th, 1925.

Switzerland.—SECRET BROADCASTING.—By order of the Swiss Federal Post and Telegraph Department, the Geneva police have recently seized the wireless receiving set of a Geneva individual who had failed to register his set and to pay the yearly 10-fr. tax, says *The Times*. According to the Swiss regulations, which compel amateurs to register their sets and to pay a tax, and which forbid them to write down what they hear, a fine may be imposed up to 1,000 fr. The Swiss police have also seized ten secret broadcasting posts set up by a secret association of young men for corresponding between themselves in Switzerland and with foreign countries.

Spain.—WAVE-LENGTH.—The fresh distribution of wave-lengths among the Madrid wireless companies in order to avoid complaints of mutual interference is again being considered. The monopoly project cherished by different emitting companies at Madrid and in the provinces seemed a little while ago to have been dropped; the scheme has now been revived, but is meeting with strong opposition.—*Reuter's Trade Service* (Madrid).

United States.—RADIO INDUSTRY.—The receipts of the United States wireless industry for 1925 are expected to exceed $500,000,000 (£100,000,000), which would be an advance of $200,000,000 over last year's figures. The increase within five years from the $6,000,000 (£1,200,000) of 1920 marks a "record" expansion for any American business. The manufacturers estimate that in 1925 they will have sold 3,000,000 wireless sets and 20,000,000 valves, as well as $150,000,000 (£30,000,000) worth of parts and accessories for home-made sets and replacements. According to Major H. H. Frost, president of the Radio Manufacturers' Association, the industry now employs about 300,000 persons in 1,200 factories and 40,000 workshops. Out of 584 existing broadcasting stations, 108 are operated by educational institutions, 47 by churches, and 39 by newspapers.—*The Times*.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the "Electrical Review" in which the "Official Notice" appeared in our advertisement pages.)

Open.

Ashford.—December 14th. Electricity Department. Concrete engine foundations, concrete cooling pond, reinforced concrete road, steam and small electric circulating water pump, fuel-oil pump, oil-purifying plant, fuel-oil storage tanks, &c. (See this issue.)

Australia.—SYDNEY.—February 1st. Municipal Council. Bunnerong power house equipment. Six 25,000-kW turbo-alternators, 18 100,000 lb. per hour boilers, &c., and 33,000-V switchgear. (November 13th.)

MELBOURNE.—April 12th. State Electricity Commission of Victoria. Plant for the Sugarloaf and Rubicon hydro-electric scheme, consisting of turbo-generators, transformers, switchgear, cranes, and accessory plant. The Secretary, 22-32, William Street, Melbourne.*

Victorian State Railways. January 20th, 1926. Automatic battery charging equipment.* January 13th. Double recording wattmeter.*

Banff.—December 14th. Town Council. Electrical work in connection with the new Town Hall. Specifications from Town Clerk.

Belgium.—December 2nd. Belgian Post and Telegraph authorities, La Salle Madeleine, Brussels. Supplying and laying telephone cables at Ostend, La Panne, and Knocke. Particulars (Cahier des Charges Special No. 3-159) for 5 fr.

Bridlington.—December 7th. Electricity Department. One oil engine, direct coupled to a 275-kW d.c. generator, fuel storage tank, cooling tower, pipework, and pumps. (November 13th.)

Cork.—Public Works Department, Dublin. Installation of electric lighting in the Munster Institute, Cork. Mr. J. J. Healy, secretary.

Dublin.—December 10th. Great Southern Railways Co. Stores for six months, including electric lamps, &c. Stores Superintendent, Inchicore, Dublin.

Egypt.—December 30th. Inspecting Engineer in London, Queen Anne's Chambers, S.W. Telegraph and telephone material and motor generator and telegraph apparatus.

ALEXANDRIA.—December 10th. Ministry of the Interior. Machinery in connection with the waterworks scheme at Mellawi, consisting of electric motors and centrifugal pumps, control panels, l.p. armoured cable, &c. (C.X. 1,796.)*

Exeter.—December 11th. Electricity Department. One 3,000-kW steam turbo-alternator and accessories. (November 20th.)

Glasgow.—December 4th. Corporation Health Department. Electric lighting installation and heating works in connection with the alterations and extensions to Mount Blow Home, Dalmuir. Specifications from Office of Public Works, City Chambers.

London.—METROPOLITAN ASYLUMS BOARD.—December 2nd. Renewal of electric cables, &c., at the Brook (Fever) Hospital, Shooters Hill, Woolwich, S.E. (November 13th.)

ISLINGTON.—December 17th. Electricity Committee. One 75-kW a.c. motor and d.c. generator, with starters, switchgear, &c., and three 5,000-kVA Scott-connected transformers, &c. (November 20th.)

H.M. OFFICE OF WORKS.—December 3rd. Electrical accessories. (November 20th.)

Manchester.—December 8th. Tramways Committee. Permanent-way special trackwork. Specifications from Mr. H. Mattinson, general manager and chief engineer, 55, Piccadilly, Manchester.

Marlborough.—Borough Council. Conversion of 62 street lamps from gas to electricity, including connecting up to existing mains. (November 20th.)

New Zealand.—WELLINGTON.—January 19th, 1926. Public Works Department. 50,000- and 110,000-V switchgear and steelwork for the Waikato electric power scheme. (B.X. 2,157.)*

January 26th. 50,000-V switchgear for the Waikato electric power scheme; transformers for the Lake Coleridge power scheme.*

GISBORNE.—Borough Council. Diesel engine, alternators, and auxiliary plant, rotary converter, and switchboard. (November 13th.)

Normanton.—November 30th. Urban District Council. Electric wiring of houses, Snydale Road. Specifications from Mr. J. Hepton, electrician, Council Offices.

Oldham.—December 5th. Electricity Department. Eight water-tube boilers, with superheaters, chain-grate stokers, steel chimneys, and induced draught plant. (November 6th.)

Peterborough.—November 30th. Electricity Department. Buildings and civil engineering work, pulverised fuel equipment, two boilers and boiler-house equipment, one 6,000-kW turbo-alternator and turbine-room equipment, e.h.p. and l.p. switchgear, &c. (November 13th.)

South Africa.—JOHANNESBURG.—December 14th. Electricity Supply Commission. Plant and material for transmission lines and sub-stations in connection with the supply of electricity in the Cape area rural districts.*

December 23rd. Union Tender Board. Telephone apparatus and supply of telegraph material for the Department of Posts and Telegraphs.*

December 17th. Municipal Council. 2,000-kW motor converter. (B.X. 2,142.)*

CAPE TOWN.—December 3rd. Electricity Department. Sub-station plant and transmission lines. (B.X. 2,139.)*

Thornton.—December 13th. Urban District Council Electricity Department. Supplying, laying, jointing, and coupling-up complete of an electricity supply system. (November 20th.)

Uruguay.—MONTEVIDEO.—January 29th. State Electricity Supply Works. Fuse wire, enamelled lamp shades, cut-outs, switches, lampholders, sockets, &c. (B.X. 2,126.)*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Durham.—County Council. Accepted: —
Installation of electricity at Ryhope police station.—Maggs & Gordon.
Electrical installations at schools:—Haswell elementary (£184); Horden (£84); and Shotton (£280).—Simm & Richardson. South Hetton (£170).—Reid, Ferens & Co.
Departmental telephones (£126).—Devereux, Mordee & Co.

Dorchester.—Electricity Committee. Recommended:—
Supplying and laying cable, Victoria Park district (£561).—Johnson and Phillips, Ltd.

Exeter.—Tramways Committee. Accepted:—
Four tramcars (£7,374).—Brush Electrical Engineering Co., Ltd.

Government Contracts.—The following Government contracts were placed during October, 1925:—

ADMIRALTY, CONTRACT AND PURCHASE DEPARTMENT.
Battery spares.—Hart Accumulator Co., Ltd.
Condenser boxes.—Automatic Telephone Mfg. Co., Ltd.
Junction boxes.—Hawkers, Ltd.
Junction and distribution boxes.—Park Royal Engineering Co., Ltd.
Cells.—London Battery & Cable Co., Ltd.
Electric travelling crane.—Cowans, Sheldon & Co., Ltd.
W./t. heterodyne units.—H. W. Sullivan, Ltd
Lamp fittings.—W. McGeoch & Co., Ltd.; Fairless Engineering Supplies Co., Ltd.
Motor generators.—Newton Bros. (Derby), Ltd.
Motors and control gear.—F. & A. Parkinson, Ltd.
Terminal panels.—Park Royal Engineering Co., Ltd.

WAR OFFICE.
Secondary batteries.—Pritchett & Gold and E. P. S. Co., Ltd.
Electric cable.—Callender's Cable & Construction Co., Ltd.
Electric cells.—Edison Swan Electric Co., Ltd.
Secondary station cells.—Chloride Electrical Storage Co., Ltd.
Conduit and fittings.—Barton & Sons, Ltd.
Copper sheet.—British Insulated & Helsby Cables, Ltd.; H. H. Vivian and Co., Ltd.
Ebonite.—Hightensite & Ebonite Mfg. Co., Ltd.
Electric lighting fittings.—Cable Accessories Co., Ltd.
Generators.—Small Electric Motors, Ltd.
Power units.—Douglas Motors, Ltd.
Switchboards.—General Electric Co., Ltd.
W./t. valves.—British Thomson-Houston Co., Ltd.; Edison Swan Electric Co., Ltd.; General Electric Co., Ltd.

AIR MINISTRY.
Thermo ammeters.—E. Turner.
Underground cables (Wittering).—G. E. Taylor & Co.
Fans (Middle East).—Veritys, Ltd.; Metro-Vick Supplies, Ltd.
Switchboards (Altrincham).—Erskine, Heap & Co.
Generating sets.—Mark Webber, Ltd.
Motor generators.—W. Mackie & Co., Ltd.
Valves.—Edison Swan Electric Co., Ltd.; British Thomson-Houston Co., Ltd.; General Electric Co., Ltd.; Mullard Radio Valve Co., Ltd.

POST OFFICE.
Telephone apparatus.—Automatic Telephone Mfg. Co., Ltd.; British L. M. Ericsson Mfg. Co., Ltd.; International Electric Co., Ltd.; Peel-Conner Telephone Works; Radio, Phonopore & Electricals, Ltd.; Siemens Bros. & Co., Ltd.; Telephone Condenser Co., Ltd.; Western Electric Co., Ltd.
Testing and protective apparatus.—Phœnix Telephone & Electric Works, Ltd.; Power Equipment Co., Ltd.
Battery stores.—Alton Battery Co., Ltd.
Telephone cabinets.—Siemens Bros. & Co., Ltd.
Cable (various).—British Insulated & Helsby Cables, Ltd.; Enfield Cable Co., Ltd.; Hackbridge Cable Co., Ltd.; Johnson & Phillips, Ltd.; Union Cable Co., Ltd.; Western Electric Co., Ltd.
Loading coils.—Western Electric Co., Ltd.; General Electric Co., Ltd.
Telephone cords.—British Insulated & Helsby Cables, Ltd.; Western Electric Co., Ltd.
Ducts.—Doulton & Co., Ltd.
Tungar rectifiers.—British Thomson-Houston Co., Ltd.
Bronze wire.—T. Bolton & Sons, Ltd.; British Insulated & Helsby Cables, Ltd.; R Johnson & Nephew, Ltd., F. Smith & Co.
Copper wire.—T. Bolton & Sons, Ltd.; British Insulated & Helsby Cables, Ltd.; R. Johnson & Nephew, Ltd.; Nevill Druce & Co., Ltd.; Shropshire Iron Co., Ltd.; F. Smith & Co.; J. Wilkes, Son and Mapplebeck.
Switchboard wire.—General Electric Co., Ltd.; Macintosh Cable Co., Ltd.
Manufacture, supply, drawing-in and jointing cable.—Sloan-City, North-Palmer's Green and Brixton-New Cross Junction: Callender's Cable and Construction Co., Ltd.
Electric lighting installation.—Mount Pleasant Sorting Office: Electrical Installations, Ltd.
Electric lifts.—G.P.O., South: Etchells, Congdon & Muir, Ltd. Douglas (Glasgow) telephone exchange: J. Bennie, Ltd.
L.p. switchgear.—Mount Pleasant: Crompton & Co., Ltd.
Telephone exchange equipment.—Primrose Hill: British L. M. Ericsson Mfg. Co., Ltd.; sub-contractors: Chloride Electric Storage Co., Ltd., for batteries. Crompton & Co., Ltd., for machines. Wellington (Salop): British L. M. Ericsson Mfg. Co., Ltd. Wiltshire (Lancs.), Blackburn, Wembley, Thornton Heath, Grangewood (London), Wimbledon, Speedwell, Kingston, Hounslow, Grosvenor (London): Automatic Telephone Mfg. Co., Ltd. Royal (London): General Electric Co., Ltd.
Private branch exchanges.—Lord Mayor Treloar's Cripple Hospital and College; Manchester Corporation (Paving, Sewering and Highways Department); Birkenhead Corporation; Bleachers' Association, Ltd. (Manchester): Relay Automatic Telephone Co., Ltd.
Telephone repeater station power plant.—General Electric Co., Ltd.

H.M. OFFICE OF WORKS.
Wiring, &c.—British Museum, White Wing: T. Clarke & Co., Ltd.

CROWN AGENTS FOR THE COLONIES.
E.h.p. and underground cable and boxes, &c.—W. T. Henley's Telegraph Works Co., Ltd.
Telegraph cable and jointing material.—Johnson & Phillips, Ltd
Electric bracket cranes.—J. Booth & Sons, Ltd.
Electric column crane.—Craven Bros. (Manchester), Ltd.
Electric lifts.—Smith, Major & Stevens.
Train-lighting equipment.—J. Stone & Co., Ltd
Switchgear.—English Electric Co., Ltd.
Ironclad switchgear.—Metropolitan-Vickers Electrical Export Co. Ltd.
Telegraph and telephone materials, &c.—Siemens Bros. & Co., Ltd.
Telephone switchboard.—British L. M. Ericsson Mfg. Co., Ltd.
Train control apparatus.—Western Electric Co., Ltd.

Hull.—Electricity Committee. Accepted:—
Three engines and exciter (£650).—Marple & Gillott, Ltd.

London.—CLAPHAM.—L.C.C. Education Committee. Installation of electric lighting at New Road school, Clapham:—

Commercial Telephone & Electrical Co., Ltd. (Recommended.)	£528
Smethurst & Co. (London), Ltd.	532
Bailey & Incledon	534
R. Langston-Jones & Co.	573
A. Hawkins & Sons	595
J. Biggs	610
J. Brent & Co., Ltd.	685
Burdette & Co., Ltd.	687

Maidenhead.—Board of Guardians. Accepted:—
Installing electric lighting in the sick wards at the Institution.—S. Evans and Co.

Northampton.—Howden-Ljungström Preheaters (Land), Ltd., has received an order from the Stirling Boiler Co., Ltd., for two large preheaters to work in conjunction with two 50,000-lb. boilers to be installed at the Northampton Electric Light and Power Co.'s station.

Preston.—Finance and General Purposes Committee. Accepted:—
Electrical winding apparatus for Town Hall clock, including overhauling and repair (£306).—W. Potts & Sons, Ltd.

South Shields.—Reporting on the purchase of foreign meters, the electrical engineer states that he has obtained a quotation from Messrs. Robert Hornby & Co., Ltd., the London agents for a Continental firm, from which it appears that in sizes up to 15 amperes he can purchase at 12s. per meter cheaper, and in the larger size of 20 amperes 19s. cheaper than is at present being paid. The question of the purchase of foreign meters is to be discussed at the next meeting of the Electricity Committee.

Tynemouth.—Electricity Committee. Accepted:—
Cable.—Hackbridge Cable Co., Ltd., and Macintosh Cable Co., Ltd.

West Saltney.—Council. Accepted:—
50 lamp standards (£181).—W. Lucy & Co., Ltd.

Winchester.—We are informed that the amount of the accepted tender of Messrs. Babcock & Wilcox, Ltd., for boiler plant for the Corporation Electricity Department is £4,964, not £5,188 as stated in our issue of November 20th.

Forthcoming Events.

Royal Society of Arts.—Monday, November 30th. At John Street, Adelphi, W.C. At 8 p.m. Cantor Lecture, "Coal Ash and Clean Coal," by Dr. R. Lessing. (Lecture II.)

British Electrical Development Association (North-Eastern Area Sub-Committee).—SECOND CONFERENCE.—Monday, November 30th. At Messrs. Sopwith's Lounge, Northumberland Street, Newcastle-on-Tyne. Discussion on "The Possibilities of To-day," to be opened by Mr. A. Albrecht.

Institution of Civil Engineers.—Tuesday, December 1st. At the Institution, Great George Street, S.W. At 6 p.m. Paper on "Trafford Wharf Reconstruction at the Manchester Docks," by Mr. H. A. Reed.

Electrical Society of Glasgow.—Tuesday, December 1st. Paper on "Wiring Systems," by Mr. T. S. Seymour.

National Association of Supervising Electricians.—Tuesday, December 1st. At the Junior Institution of Engineers, 39, Victoria Street, S.W. At 7.15 p.m. Lecture on "Electric Time Service," by Mr. F. Hope-Jones.

Roentgen Society.—Tuesday, December 1st. At 32, Welbeck Street, W. At 8.15 p.m. Ordinary scientific meeting.

Edinburgh Electrical Society.—Wednesday, December 2nd. At the Royal Scottish Society of Art, 117, George Street. At 8 p.m. Discussion night.

Institution of Electrical Engineers.—Thursday, December 3rd. At the Institution, Victoria Embankment, W.C. At 6 p.m. Paper on "An All-Electric House," by Prof. S. P. Smith.

(North-Western Centre).—Tuesday, December 1st. At the Engineers' Club, Manchester. At 7 p.m. Lecture on "The Engineer: His Due and His Duty in Life," by Mr. T. Carter.

(South Midland Centre).—Wednesday, December 2nd. At the University, Birmingham. At 7 p.m. Paper on "An All-Electric House," by Prof. S. P. Smith.

(Western Centre).—Monday, December 30th. At the South Wales Institute of Engineers, Cardiff. At 6 p.m. Lecture on "Switchgear Developments during the Past 20 Years," by Mr. J. H. Thomas.

(Scottish Centre).—Wednesday, December 2nd. At the Grosvenor Restaurant, Glasgow. Annual dinner.

(Wireless Section).—Wednesday, December 2nd. At the Institution, Victoria Embankment. At 6 p.m. Paper on "The Performance of Amplifiers," by Mr. H. A. Thomas.

Junior Institution of Engineers.—Friday, December 4th. At 39, Victoria Street, S.W. At 7.30 p.m. Lecturette, "Super Heterodyne Reception," by Mr. A. E. Bowyer-Lowe.

Association of Mining Electrical Engineers (Western District Sub-Branch).—Saturday, December 5th. At 62, Wind Street, Swansea. Paper, "A Review of the Mines Electricity Acts," by Mr. W. J. Charlton.

Institution of Engineers-in-Charge.—Wednesday, December 9th. At St. Bride's Institute, Bride Lane, E.C. At 7.30 p.m. Paper on "Oil Fuel for Commercial Purposes," by Mr. H. G. Burford.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names of makers or suppliers of:—

The "FRANKA" Vacuum Cleaner.
The "KAPLAN" Turbine (British makers only).

Notes.

B.E.S.A. Specification.—To the British Engineering Standards Association specification for tungsten filament electric lamps (No. 161) have been added three new schedules: Normal vacuum train lighting lamps, gasfilled train lighting lamps, and traction vacuum type lamps (series burning). The adoption of these schedules by those responsible for train and tramcar lighting will reduce the variety of types of lamps used for this purpose, and do away with the large number of differing pressures for which these lamps have had to be made in the past. The schedules, copies of which may be obtained from the B.E.S.A. Publications Department, 28, Victoria Street, London, S.W.1, will be included in loose pamphlet form in B.S.S. 161, until that document is revised, when they will be incorporated. The new edition is expected to be ready early in the New Year.

Electrical Association for Women.—We are interested to learn that the inauguration of the Glasgow and District Branch of the above Association, on November 19th, was a success. The Corporation of Glasgow and the Electricity Committee gave the Branch Association every support, including the use of the City Chambers for the inaugural meeting, and the Corporations of Greenock and Paisley also co-operated. Lady Belhaven, the first president of the branch, said that electricity was, or ought to be, in this country the poor man's servant, but though it was cheap once it was installed, there was considerable initial expenditure, which was beyond the poor man's purse. They were, however, only at the very beginning of the things that electricity could do. The origin and work of the Association were explained by Miss C. Haslett. Mrs. Sadler, widow of ex-Bailie Sadler, was appointed hon. treasurer of the branch, with Miss K. F. Kennedy as hon. secretary.

Scott's Old Boys' Association.—The annual dinner of the above Association was held on Saturday last at the Engineers' Club, London, with Mr. C. Newton Russell in the chair. There was a good gathering of "Old Boys," as it was a special meeting, the guest being Mr. Howard Marryat, who is one of the oldest of the "Old Boys," and has hitherto played the greatest part in keeping them together. After dinner the Chairman, in proposing the health of Mr. Marryat and the thanks of the Association to him for his indefatigable work in keeping the "Old Boys" in touch with each other, presented him with a framed testimonial and photograph of the old works and boys, and a case of pipes.

The Association is desirous of obtaining the names and addresses of some of the "Old Boys" who have been out of touch for some years, and if this notice reaches any of them, they are asked to communicate with Mr. Howard Marryat, of 28, Hatton Garden, E.C.1, who will see that in future they shall have invitations to the annual dinner, &c.

Midland Electrical Engineers' Ball.—This very popular and well-attended function which has now become a permanent annual fixture was held at the Grand Hotel, Birmingham, on Friday evening, November 20th, Mr. W. H. Heaton acting as chairman.

Mr. R. A. Chattock, this year's President of the Institution, appeared to be enjoying himself as much as he always does, with Mr. W. B. Woodhouse as a good second, and among those from far afield we had the pleasure of meeting Mr. Salt, of Carlisle and Mr. Bexon, of Kilmarnock.

Mr. Harry Lawson displayed even more agility than usual and if, perchance, he were to forsake engineering (which the gods forbid), he would undoubtedly find a place in any troupe of Russian dancers.

Over 400 were present, the Corporation and company engineers being particularly well represented, as were also the great Midland electrical engineering concerns, and as everyone seemed to know everyone else the evening was, as is always the case at Birmingham, a thoroughly cheery one.

The popular and indefatigable Mr. W. Y. Anderson and his executive colleagues may congratulate themselves most heartily on the complete success of all the arrangements which had been made, and we are sure that all those present would wish to thank them for the weeks of toil which must have been necessary to bring about such perfect staff work. We look forward to next year.

Prize Award.—FONDATION GEORGE MONTEFIORE.—The Triennial Prize of this Trust has been divided by the jury of experts, into four parts. The first, comprising 6,000 francs, has been awarded to Mr. F. Creedy, of London, for his two papers entitled "Some Developments in Multi-speed Cascade Induction Motors" and "Variable Speed Alternating-current Motors without Commutators"; the second, of 4,000 francs, to Professor J. B. Whitehead, of Baltimore, for his paper "Gaseous Ionisation in Built-up Insulation"; the third, of 4,000 francs, to Mr. Chechelowsky, of Antwerp, for his paper "Study on Operating and Releasing Times of Telephone Relays"; and the fourth, an additional prize of 2,000 francs, to Mr. Raymond Wilmotte, of London, for a paper on "Une Nouvelle Forme de Transformateur."

The President announced that the next competition would take place in 1927 and that the prize fund would amount to 20,500 francs.

Local Society.—EDINBURGH ELECTRICAL SOCIETY.—Members of the Society on November 18th heard a most interesting lecture on accumulators, the title being "Stationary Batteries for Country House Lighting and Power Station Work," by Mr. E. C. Mackinnon, M.I.E.E. (Chloride Co.). Lantern slides were shown and a very interesting evening was spent. Mr. J. G. Burchell, president of the Society, occupied the chair, 30 members being present.

Electrical Vehicles in Italy.—Notwithstanding the increasing vogue of petrol vehicles in Italy, it is interesting to learn that the postal transport work in Turin is done by a contracting firm which employs a fleet of about 40 electric vans for the work. The Società Italiana de Veicoli Elettrici has a large fleet of electric taxicabs in service in Milan, while a company is also running a number of single-deck electric 'buses in Rome.

Appointments Vacant.—Foreman electrician (£450) for the Air Ministry Works and Buildings Department, Iraq. Assistant switchboard attendant (74s. 3d.) for the Leyton U.D.C. Electricity Works. Draughtsman (temporary) (110s.), for the Battersea Borough Council Electricity Department. (See our advertisement pages to-day.)

Fatality.—While four men were erecting a wireless pole and aerial in a garden at Havercroft, near Barnsley, recently, the pole swayed and fell on to the wires belonging to the Yorkshire Electric Power Co., which convey power from Thornhill to the New Monckton Collieries. The aerial came in contact with a live wire, and Harrison Milburn (27), a foreman at the collieries, received such a shock that he died instantly. Two of the other men incurred shock and were slightly injured. At the inquest a verdict of "Death from misadventure" was returned. An official of the power company stated that the voltage upon the line was 11,000 volts.

Attempt to Blow up Electric Cable.—An attempt, by shale-oil strikers, it is believed, says the *Manchester Guardian*, was made during the night of November 20th-21st to blow up a main electric cable from Roman Camp, which supplies power to the works of the Scottish Oil Co. at Broxburn, Uphall, and Middleton, and other pits. Gelignite was exploded under the cable only a few yards from the main Edinburgh to Bathgate railway. Much damage was done, but the perpetrators failed in their chief purpose, and they only succeeded in cutting a branch cable supplying power for the pumps in the Loaninghill mine.

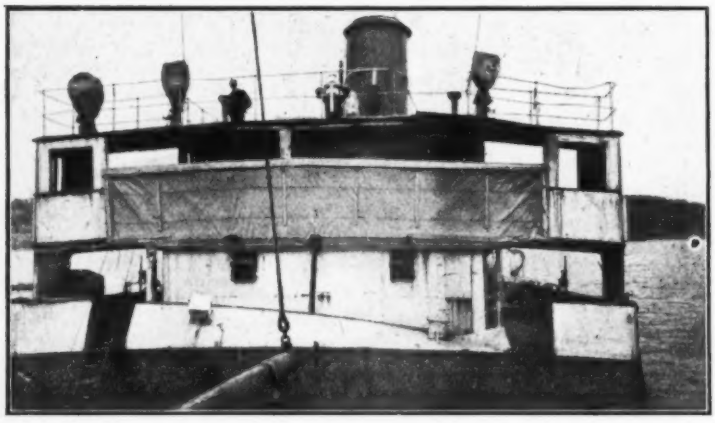
A Cable Ship's Ordeal. — With her decks presenting a scene of chaos and her after holds filled with water, the cable ship *Lord Kelvin* entered Queenstown Harbour on the morning of November 10th after a severe ordeal in mid-Atlantic during a gale, as has already been reported in our pages.

In an interview with a *Journal of Commerce* correspondent, one of the officers said that when the majority of the crew were asleep late at night on November 6th, a wave struck them broadside, carrying everything in its path overboard. "We thought the ship was about to sink, and an S.O.S. signal was sent out. Previously we had picked up signals of distress from six other vessels the same night. All the boats had been smashed or washed overboard, the engine-room telegraphs and other deck fittings were torn away and carried overboard, the forward bridge superstructure was washed away, the tops of the tank hatches were stove in and the holds flooded, and the saloon was badly buckled. All the lights had been put out of action owing to the inrush of water in the engine-room, which damaged the dynamos. During the darkness we almost collided with two ships that were coming to our aid, and only by lighting flares could we make our presence known. We managed to get the ship around and run before the gale.

"During the height of the storm several large buoys, weighing about a ton each, became loosened on the foredeck, and Mr. Foote, the chief officer, volunteered, with a number of men, to secure them. While this dangerous task was being accomplished, Mr. Foote was caught by a big wave, and was going over the side when a member of the crew grabbed him by his clothes and pulled him back again. Several of the crew received injuries, but none was seriously injured.

"Orders for the engine-room from the bridge had to be conveyed by relays of men transmitting the verbal instructions from one to the other."

The accompanying illustrations, for which we are indebted to Mr. A. N. C. Horne, of Queenstown, show some of the damage caused; note the temporary repairs to the bridge, a large portion of which was broken in.



The Cable Ship "Lord Kelvin": Damage Caused in Recent Gale at Sea.

A New Type of Radiation.—It is reported that Dr. R. A. Millikan, director of the Physics Laboratory of the California Institute of Technology, has discovered a type of high-frequency radiation of very great penetration, having a wave-length only one-fiftieth of that of the shortest rays previously known—about one ten-millionth of that of light rays. The existence of such rays has been suspected for many years. Dr. Millikan, whose scientific achievements compel respect for his statements, identified the rays by sending balloons up to a height of nearly ten miles, carrying recording electroscopes, and by experiments on Mount Whitney at a height of 11,800 feet, where he found that the rays could penetrate the equivalent of 68 feet of water or 6 feet of lead before complete absorption. He believes that they are produced by nuclear transformations enormously more energetic than those involved in the radioactive changes that are already known, and that they reach the earth at all hours of the day and night with equal intensity.

Parliamentary.—On November 19th, Mr. Albery asked the Home Secretary whether there was any independent periodic inspection of water reservoirs or electric power dams; and, if so, by whom. Sir W. Joynson-Hicks said that accidents due to the bursting of such reservoirs or dams had fortunately been very rare and so far, at any rate, as general legislation was concerned, no provision had been made for any independent periodic inspection of such works.

Road Authorities and Mains.—A Committee of the House of Lords, on November 19th and 20th, heard an application by the Northamptonshire County Council for the insertion of special protective clauses in an Order proposed to be granted by the Board of Trade to the Northampton Gas Light Co. The main provision asked for by the County Council was to the effect that if it was carrying out improvements to roads, and it was found necessary to alter the position of the gas company's mains, the cost should be borne by the company. The general law was that the cost of moving mains must be borne by the authority carrying out the improvements.

On behalf of the County Council it was stated that the provisions of the general law were passed at a time when roads were not subjected to the heavy traffic which they had to bear at present, and road construction methods were quite different; therefore, the general law was inadequate to meet present-day conditions. On behalf of the gas company, however, it was contended that if there were to be an alteration of the existing law, it should be effected by general legislation, applicable to all gas undertakings, and not to one particular company.

It was mentioned that representatives of public utility undertakers—gas, water, electricity, &c.—were at present conferring with the County Councils' Association and representatives of other highway authorities in an endeavour to agree upon conditions with respect to the laying of mains which should apply generally throughout the country, and should be embodied in a general Act. It was pointed out that a decision by the Committee might prejudice the work of the conference and it was suggested that the Gas Company's Order should be held up, pending a decision of the conference. The Gas Company, however, would not assent to this course.

Subsequently, the County Council asked the Committee to insert a protective clause similar to one inserted in an Act of the Sunderland & South Shields Water Co., in 1921, by a Committee of the House of Lords, which contained the provision now sought. Further, the Council offered to undertake that, if and when the conference referred to produced a clause applicable to public utility companies generally, it would substitute that clause for the Sunderland clause. It was stated on behalf of the Gas Company that the clause in the Sunderland Act was inserted in view of special circumstances.

The Committee decided not to grant the County Council the protection asked for.

The Severn Barrage Scheme.—On November 23rd, Colonel Woodcock asked the President of the Board of Trade if it was his intention to proceed further with the Severn tidal power scheme inquiry, in view of the fact that the city of Bristol was proposing to spend about £1,000,000 in the erection of a power station in close proximity to the River Severn to serve Bristol and part of the surrounding district.

Sir Burton Chadwick said that the practicability of the Severn Barrage scheme had been referred to the Committee of Civil Research, which had appointed a special sub-committee to advise on the whole question. Any local electrical developments would no doubt be brought to the notice of the sub-committee by the Departments immediately concerned.

Welsh Dam Burst.—Inquest Postponed.—The inquest upon the bodies of the victims of the recent North Wales dam burst has been further adjourned until December 2nd. It has been decided to hold it at Conway, as most of the inhabitants of Dolgarrog are employés of the Aluminium Corporation or dependants of employés.

The Public Works and Roads Exhibition.—That the activities of local Government service grows more diverse and important each year was clearly indicated by the Public Works, Roads and Transport Congress and Exhibition (November 19th to 26th) which is held biennially at the Royal Agricultural Hall, London. The present show was the third of the series, and some 720 authorities nominated 1,315 delegates to the Congress, which considered, amongst other things, "The Uses of Electricity for Housing and Institutional Purposes" (paper by Mr. R. Hardie, Glasgow, arranged by the I.M.E.A.) and the "Repair of Roads Against Tramway Track" (paper by Mr. F. Wood).

The Agricultural Hall has been re-lighted, the installation having been carried out by Messrs. Jacob, White & Co., Ltd. The overhead fittings (Lighting Equipment Co., Ltd., St. Albans) employed are of the "Trent" pattern with prismatic band refractors, and gasfilled lamps, sprayed one-third of the way up, have been used to eliminate any glare that might arise from the low position of the filaments in the refractors. The "Goliath" porcelain holders are carried by anti-vibration disks, and there are six rows of 13 lamps. The area illuminated is 312 ft. by 125 ft., which was originally lighted by 35 10-amp. flame arcs, consuming 19 kW; with the new 300-watt gasfilled lamps the consumption is 23.4 kW.

Amongst the exhibits Messrs. Walker Vehicles, Ltd., had a "balanced drive" electric tractor on view, which should be of use to municipalities on account of its versatility. On the stand of Messrs. Hadfields, Ltd., tramway materials included car wheels which had tires secured by the firm's "lock-fast" method, whilst Messrs. Richard Hill & Co., Ltd., showed electrically-welded fabric for reinforcement in road construction.

Amongst the air compressors shown by Messrs. Reavell and Co., Ltd., was a portable set intended for tramway repair work; it is run from the overhead trolley wire, and is of sufficient capacity to operate a concrete breaker on heavy work, the motor being totally-enclosed and the compressor air cooled so that no water circulation is needed. The exhibit of the Horstmann Gear Co., Ltd., comprised an extensive range of automatic lighting appliances for street lamps; Newbridge time switches are made in a variety of types for from 1.5 to 50 amperes and with 8- to 45-day clocks. The Hackney Borough Council is fitting type E/B/1 time switches to all lamps in its area.

The Sullivan Machinery Co.'s electric hoists and haulage gear combine light weight and portability; ball bearings are employed, and the whole of the mechanism, including the driving motor, is contained within the drum itself. The road materials displayed by W. Shepherd & Sons, Ltd., included parging blocks for paving tramway margins; they are 9 in. long and made of brickware, so shaped as to fit the cavity at the side of the rails and afford a solid vertical paving face. Their use is claimed to obviate the necessity for filling the rail cavities with cement grout, &c. Weldless steel tramway, power transmission, and telegraph poles were shown by Messrs. Bromford, Ltd., besides superheater tubes, steam mains, &c.

The Jackson Electric Stove Co., Ltd., was also exhibiting, and in conclusion it may be stated that about 176 firms displayed their products in some 82,820 sq. ft. of space.

Educational.—We have received a copy of the annual report for the 129th (1924-25) session of the Royal Technical College, Glasgow. The total number of students in attendance during the session is shown as 4,753, as compared with 4,816 for the previous year. The statement of accounts for the year shows an expenditure of £72,545, resulting in a deficit at the end of the year of £1,873. The plant in the electrical engineering workshop has been thoroughly overhauled, new machine tools have been acquired, and a line of shafting has been installed. Special evening courses were given during the year in technical radiology, wireless telegraphy and telephony, and electrical machine design.

Institution Notes.

Institution of Electrical Engineers.—SHEFFIELD SUB-CENTRE.—In a recent paper, Mr. A. R. Cooper, a student member, said that the application of electro-pneumatic machinery to colliery safety requirements was worth the investigation of every colliery engineer; identical units had been in use for many years on the Underground and on the biggest railways in the world. The process of delivering the full tubs and filling the cage again with empty ones involved many subsidiary operations, particularly in the case of an upcast shaft where airlocks had to be used. In the electro-pneumatic system all those operations had been smoothed out into an ordianry cycle in which everything was so interlocked that the possibility of accidents or mishaps was reduced to an absolute minimum, and the whole system was under the control of a master switch which could stop further progress at any point of the cycle. With lantern slides to illustrate his descriptions, Mr. Cooper dealt in detail with the apparatus, concluding with a description of the installation at the Silverwood Colliery, near Rotherham.

Illuminating Engineering Society.—At the opening meeting of the Society on November 26th, at the Royal Society of Arts, reports on progress during the vacation and developments in lamp and lighting appliances were to be presented, and some interesting novelties, including new forms of lighting fittings, the "Mutochrome" colour projector, artificial daylight, new photometric apparatus, &c., were to be shown.

Diesel Engine Users' Association.—OIL ENGINE WORKING COSTS.—At the November meeting, the Association considered a report which had been prepared by the Committee on the subject of heavy-oil engine working costs for 1924-25, which forms the fourth of the annual series. The average total engine cost of 36 home stations with a total output of over 32,000,000 units and with an average annual plant load factor of 15.3 per cent. was 0.806d. per unit generated for the year 1924-25. The improvement in this figure, as compared with the average figure of 0.899d. per unit generated for the year 1923-24, is largely accounted for by the reduction in the maintenance cost. The average total engine cost for eight overseas stations with a total output during the year of over 18,000,000 units was 0.746d. per unit generated. Among the 44 undertakings listed in the report, 19 additional engines have been put into service, representing an increase in the installed capacity, taken over the whole of the undertakings, of 25 per cent. Of the 19 engines put down, four are of 1,000 h.p. or upwards, four are of 750 h.p., and the average capacity of the new units installed is over 500 b.h.p.

Physical Society of London.—At the meeting held on November 13th, Mr. F. E. Smith, C.B.E., F.R.S., president, being in the chair, a vote of congratulation on the recent presentation to him of the Hughes Medal of the Royal Society was carried by acclamation. A paper entitled "Valve-Maintained Tuning Forks without Condensers" was read by Mr. T. G. Hodgkinson, A.M.I.E.E. The paper was illustrated by a demonstration. The valve-maintained tuning fork is now a much-used piece of apparatus, but the influence of the conductance of the valve electrodes on the design has not been considered. The paper discussed the design of valve-maintained tuning forks without condensers and showed that the conductance of the valve grid decided the direction in which the electrode coils must be wound; and also that it was advantageous, particularly in the case of low-frequency forks, to interpose transformers between the valve electrodes and the fork magnets.

In the discussion, Dr. W. H. Eccles said that the author had shown how account must be taken of the valve characteristics in designing the apparatus, and how to secure that the maintained frequency should be the true frequency of the fork. The latter point was particularly important when the harmonics of the fork frequency were employed: thus it was possible to utilise the twenty-ninth harmonic of a 1,000-cycle fork, giving a frequency of 60,000 cycles. In this way standards could be obtained and oscillations generated over a wide range of the wireless spectrum, at constant and accurately known frequencies. Dr. C. V. Drysdale said that stroboscopic methods of measurement had always suffered from the defect that the rate of a fork was varied by the means adopted for maintaining vibration. Dr. Eccles's invention of the valve-maintained fork was of great importance as a solution of this difficulty, and the author was to be congratulated on having put the matter on a satisfactory quantitative basis.

Our Personal Column.

(Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.)

SIR THOMAS CALLENDER, managing director of Callenders' Cable & Construction Co., Ltd., is at present in America, where he is visiting some of the latest super-power stations, and also the works of the Okonite-Callender Cable Co. at Paterson, New Jersey.

Mr. G. P. DENNIS, consulting electrical engineer, of Birkenhead, has been elected a member of the Town Council.

The *Shanghai British Chamber of Commerce Journal* for October contained the following announcement:—"Mr. Donald McColl's connection with the Shanghai Electric Construction Co., Ltd., ceased on June 9th, and Mr. C. Burgess, late of the Walsall Corporation Tramways, has been appointed General Manager. Mr. R. B. Herbert has been appointed Shanghai Manager and Deputy General Manager."

Stoke Newington Borough Council Electricity Committee has received a letter from Mr. C. S. HANN (the Borough Electrical Engineer), submitting a medical certificate recommending the continuation of his treatment at Arosa for five or six months from October 13th. The Committee recommends that the four months' leave of absence previously granted to Mr. Hann be extended to six months from July 13th, 1925, on full pay, with a further three months' leave on half-pay.

Obituary.—SIR E. E. PEARSON.—We regret to record that Sir Edward Ernest Pearson, a director of S. Pearson & Son, Ltd., the well-known contractors for public works, and a brother of Lord Cowdray, passed away suddenly on November 19th at the age of 51 years. He was a director of the Electric and Railway Finance Corporation.

MR. R. FRANKLIN.—The death took place on November 16th, at his residence at Romford, of Mr. Richard Franklin, O.B.E., a director of the Chesham Electric Light & Power Supply Co. He was 49 years of age.

HERR R. M. FRIESE.—The death is reported from Berlin of Herr Robert M. Friese, who was for many years director of the Siemens-Schuckert Works in Charlottenburg, and lately acted

as adviser to the central experimental department of the associated Siemens undertakings.

MR. A. SHUTTLEWORTH.—We regret to record the death of Mr. Alfred Shuttleworth, a director and for some years chairman of Clayton & Shuttleworth, Ltd., of Lincoln, which occurred on November 22nd, at the age of 82 years.

MR. ERNEST MAY.—The death occurred on October 28th, of Mr. Ernest May, president of the Cie. Française des Câbles Télégraphiques. Mr. May was born in Strasburg in 1845, and served in the Franco-Prussian War. His interests were principally financial and he was connected with several banking firms. In 1879, Mr. May founded the Société Générale des Téléphones which installed the first telephone system in Paris; this company later became the Société Industrielle des Téléphones. He took a leading part in the field of submarine telegraphy and was one of the founders of the Société des Télégraphes Sous-Marins, which was affiliated in 1894 to the Société du Télégraphe de Paris to form the present Cie. Française des Câbles Télégraphiques in which Mr. May was active up to the time of his death. He participated in the formation of a number of radio companies.

Wills.—The late Mr. W. A. J. GUNTHER, of the firm of **Wansbrough, Skelsey & Gunther**, left **£11,406** gross and **£11,320** net personalty.

Mr. H. D. ELLIS, a director of the Tottenham District Light, Heat & Power Company, left **£54,196** gross and **£51,092** net personalty.

New Companies Registered.

Frank A. Smith, Ltd. (209,772).—Private company. Registered November 19th. Capital, £5,000 in £1 shares. Objects: To acquire the business of a wireless engineer and manufacturer of and dealer in radio apparatus now carried on by F. A. Smith at 90, High Street, Stourbridge, and 51, Broad Street, Worcester, as "Frank A. Smith," and at Union Street, Stourbridge, as "Smith's Radio Supplies." The joint managing directors are:—F. A. Smith (chairman), Love Lane, Stourbridge; and R. W. Petley, Pedmore Lodge, Stourbridge. Qualification, £500 shares. Solicitor: P. H. Chappell, Hagley Road, Stourbridge.

H. L. Wood & Son, Ltd. (209,735).—Private company. Registered November 17th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of apparatus for transmitting, communicating, or receiving music, speeches, messages or other means of communication, by radio-telegraphy and telephony, &c. The first directors are:—H. L. Wood, 7, Taswell Road, Southsea, electrical engineer; and Lilian O. Wood, 7, Taswell Road, Southsea (both permanent). Qualification of other directors, 100 shares. Secretary: F. Fuller. Registered office: 36, Russell Street, Portsmouth.

Francis Lamp Locks, Ltd. (209,732.)—Private company. Registered November 17th. Capital, £20,000 in £1 shares (16,000 10 per cent. cumulative preference and 4,000 ordinary). Objects: To carry on the business of manufacturers, repairers, importers and exporters of and dealers in implements, utensils, cylinders, screws, appliances and accessories for use in connection with devices for locking electric lamps of all kinds and for preventing the removal of lamps from the holders, &c., and to adopt agreements (1) with C. H. F. Thompson and J. A. Macdonald, (2) with the said J. A. Macdonald, and (3) with A. H. Leggett. The first directors are:—Brig.-Gen. A. H. Leggett, C.M.G., D.S.O., 3, Meadow Road, Ashtead, Surrey; Capt. V. Gordon, 12 St. James's Square, S.W.1; Comdr. C. C. Sherman, R.N., Woodville, Ashtead, Surrey; and J. N. Evans-Jackson, 37, Queen's Gate Gardens, South Kensington, S.W.7. Remuneration, £150 each per annum (chairman, £200), free of tax. Solicitors: Parkers and Hammond, Friars House, New Broad Street, E.C.2. Registered office: 83, Pall Mall, S.W.1.

Radio Exhibitions, Ltd. (209,754).—Registered November 18th as a company limited by guarantee and not having a share capital, with 1,000 members each liable for £5 in the event of winding up. The objects are:—To promote and encourage exhibitions of appliances and apparatus of all kinds used for radio-telephony and telegraphy, submarine signalling and radio transmission of every kind, to organise and hold or take part in organising and holding such exhibitions in London or elsewhere; to carry on business as proprietors or managers of exhibition halls, &c. The first directors are:—R. A. Lodge, A.S.A.A., 24, Stanley Gardens, Hampstead, N.W.3 (secretary and chief accountant of Radio Press, Ltd.); P. W. Harris, M.I.R.E., 29, South Ridgeway Place, Wimbledon, S.W.19 (editorial manager of Radio Press, Ltd.); and W. F. Edwards, A.S.A.A., Cartref, Fairfield Avenue, Edgware (commercial manager of Radio Press, Ltd.). Secretary: R. A. Lodge. Solicitors: Hodgkinson and Bonnett, 124, Chancery Lane, W.C. Registered office: Bush House, Strand, W.C.2.

Helikon Wireless Co., Ltd. (209,716).—Private company. Registered November 16th. Capital, £300 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless accessories, electricians, mechanical engineers, &c. The subscribers are:—J. Roysentul, 45, Woodberry Grove, N.4, electrical engineer, 5 shares; R. Fishler, 26, Dempsey Street, Stepney, E.1, clerk, 2 shares. The first directors are not named. No share qualification required. Solicitors: Lach Szyrma & Co., 18, Old Compton Street, W.

U-Phone Company, Ltd. (209,701).—Private company. Registered November 14th. Capital, £15,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in gramophones, phonographs, musical and sound-producing instruments, sound boxes, horns and instruments, apparatus, accessories and materials capable of being used in connection with radio-telegraphy and telephony, in particular, cables, wires, ropes, accumulators, batteries, detectors, meters, tuning switches, induction coils, condensers, headphones, thermionic valve panels, valve receivers, amplifiers, aerial and other insulators, &c. The directors are:—R. Burrill, 19, Lascelles Terrace, Roundhay Road, Leeds, cabinet maker; W. H. Wilks, 31, Blenheim Place, Leeds, cabinet maker; F. Whiteley, 116, Scarr's Lane, Milnsbridge, Huddersfield. R. Burrill may retain office while holding 1,000 shares. Qualification of directors, £100. Remuneration as fixed by the company. Solicitors: Simpson, Peckover, Curtis & Batley, 41, Park Street, Leeds. Registered office: Conway Factory, Harehills Lane, Leeds.

Lustrolux, Ltd. (209,719).—Private company. Registered November 16th. Capital, £25,000 in £1 shares. Objects: To acquire the whole of the property and assets of Crowther & Osborn, Ltd. (in liquidation), and to carry on the business of manufacturers and repairers of all kinds of apparatus and articles used in the generation, distribution, supply of electricity or electrical energy, or which are used or capable of being used for medical, scientific, radio-telegraphic or telephonic transmitting or receiving purposes, electricians, mechanical engineers, weavers and knitters of natural or artificial silk, cotton, woollen or worsted spinners, &c. The directors are:—O. W. Porritt, Torside, Helmshore, Lancs., woollen manufacturer; W. L. Turner, Abbey Manor, West Kirby, Cheshire, metallurgist (both permanent, subject to each holding 250 shares). Remuneration as fixed by the company. Secretary (*pro. tem.*): W. J. Battison. Solicitors: F. R. Locke, 9, Cook Street, Liverpool.

Felcourt Products, Ltd. (209,806).—Private company. Registered November 20th. Capital, £100 in 1s. shares. Objects:—To carry on the business of manufacturers and repairers of, and dealers in plant, machinery, apparatus, and appliances for agricultural, horticultural, electrical, radio, automobile, aerial, engineering, building, cabinet-making, furniture-making, chemical, and other businesses; builders, contractors, electricians, furnishing and general ironmongers, timber merchants, sawmill proprietors, &c. The directors are:—R. B. Matthews, Greater Felcourt, East Grinstead; W. H. Pike, 1, Felcourt Cottages, East Grinstead; W. H. R. Pike, "Oaklands Cottage," Lingfield, Surrey. Qualification, 5 shares. Remuneration as fixed by the company. Secretary: Miss Elsie E. Elmitt, The Orchard House, Felcourt, East Grinstead.

W. A. Rood, Ltd. (209,826).—Private company. Registered November 20th. Capital, £200 in £1 shares. Objects:—To adopt an agreement with W. A. Rood and E. H. Pearce and to carry on the business of electricians and wireless dealers formerly carried on by them at 74, St. George's Road, Kemp Town, Sussex. The directors are:—E. H. Pearce, 26, Lewes Crescent, Brighton, barrister; W. A. Rood, 74, St. George's Road, Kemp Town, Sussex, electrical engineer. Qualification, £5. Remuneration, £10 each per annum. Secretary: E. H. Pearce. Registered office: 74, St. George's Road, Kemp Town.

Maywood Engineering and Electrical Manufacturing Co., Ltd. (209,816).—Private company. Registered November 20th. Capital, £2,000 in £1 shares. Objects:—To acquire the property and assets of Major L. Russell-Wood, and to carry on business as electrical, mechanical, and hydraulic engineers, manufacturers of electrical apparatus and engines of all kinds, carriages, vans, wagons, carts, cycles, and other vehicles, &c. Power is taken to carry on business as chemists, druggists, and manufacturers of, and dealers in all chemicals, drugs, or other articles, &c. The subscribers (each with one share) are:—P. E. Mann, "Woodlands Glen," Tinsley, Sussex, chartered secretary; J. A. Stocker, 701, Salisbury House, E.C.2, chartered secretary. The first directors are:—P. E. Mann (chairman) and Major L. Russell-Wood. The latter is a life director so long as he holds 1,050 shares. No qualification required for other directors. Each of the shares numbered 1-350 has five votes so long as they are in the name of Lady Mills. Solicitors: Linklaters & Paines, 2, Bond Court, Walbrook, E.C. Registered office: 701, Salisbury House, London Wall, E.C.2.

Official Returns of Electrical Companies.

Leatherhead and District Electricity Co., Ltd.—Issue on November 9th, 1925, of £100 debentures, part of a series already registered.

Bucks Electric Wire and Engineering Co., Ltd.—Satisfaction in full on November 4th of debentures dated August 28th, 1924, and March 24th, 1925, securing £500 and £800 respectively.

Chloride Electrical Storage Co., Ltd. (35,389).—Capital, £500,000 in 62,000 preference, 329,625 ordinary, and 108,375 unissued shares of £1 each. Return dated June 4th, 1925. 62,000 preference and 329,625 ordinary shares taken up. £75,738 paid on 48,750 preference and 26,988 ordinary shares. £315,887 considered as paid on the remainder. Mortgages and charges, nil.

John Davis & Son (Derby), Ltd. (66,606).—Capital, £35,000 in 20,000 ordinary and 15,000 preference shares of £1 each. Return dated July 8th, 1925. 15,000 ordinary and 11,000 preference shares taken up. £26,000 paid. Mortgages and charges, nil.

Anglo-American Telegraph Co., Ltd. (2,891C).—Capital stock, £7,000,000 in £310,480 ordinary, £3,344,760 preferred ordinary, and £3,344,760 deferred ordinary stock. Return dated June 5th, 1925. All stock taken up. £000,000 paid. £6,400,000 considered as paid. Mortgages and charges, nil.

Greenwood & Batley, Ltd. (27,098).—Capital, £600,000 in 140,000 preference, 354,585 ordinary, and 105,415 unclassified shares of £1 each. Return dated August 5th, 1925. 110,660 preference and 354,585 ordinary shares taken up. £201,312 paid (being £1 per share on 69,340 preference and 121,340 ordinary, 6s. on 14,660 preference, and 10s. on 12,320 ordinary shares, and including £39 paid on 130 shares forfeited). £347,515 considered as paid on the remainder. £36 in arrears. Mortgages and charges, £100,000.

Ackroyd & Best, Ltd. (54,600).—Capital, £25,000 in 3,200 preference and 1,800 deferred shares of £5 each. Return dated October 5th, 1925. All shares taken up. £15,500 paid on 3,100 preference shares. £9,500 considered as paid on 100 preference and 1,800 deferred shares. Mortgages and charges, £50,000 sealed debentures.

Evershed & Vignoles, Ltd. (43,206C).—Capital, £30,000 in £10 shares. Return dated July 15th, 1925. All shares taken up. £30,000 paid. Mortgages and charges, £15,000.

Rangoon Electric Tramway & Supply Co., Ltd. (86,932).—Capital, £800,000 in 50,000 preference shares of £5 each and 550,000 ordinary shares of £1 each. Return dated May 15th, 1925. 50,000 preference and 300,000 ordinary shares taken up £485,000 paid. £65,000 considered as paid. Mortgages and charges, £413,258.

Chamberlain & Hookham, Ltd. (59,920).—Capital, £100,000 in 9,500 preference and 10,500 ordinary shares of £1 each. Return dated June 24th, 1925. 8,000 preference and 10,100 ordinary shares taken up. £36,990 paid on 7,298 preference and 100 ordinary shares. £33,310 considered as paid on 702 preference and 10,000 ordinary shares. Mortgages and charges, nil.

C. F. Casella & Co., Ltd. (106,869).—Capital, £17,000 in 15,000 ordinary and 2,000 preference shares of £1 each. Return dated October 14th, 1925. 12,204 ordinary and 2,000 preference shares taken up. £3,504 paid. £10,700 considered as paid. Mortgages and charges, £1,400.

Globe & Simpson, Ltd. (173,934).—Capital, £4,000 in £1 shares. Return dated August 21st, 1925. 3,100 shares taken up. £2,450. £850 considered as paid. Mortgages and charges, nil.

Rawlings Bros., Ltd. (67,908).—Capital, £100,000 in 30,000 preference and 70,000 ordinary shares of £1 each. Return dated September 25th, 1925. 20,685 preference and 50,744 ordinary shares taken up. £71,429 paid. Mortgages and charges, nil.

Baynes Electrical Co., Ltd. (176,835).—Capital, £2,000 in £1 shares. Return dated October 26th, 1925. 213 shares taken up. £213 paid. Mortgages and charges, nil.

Electro-Mechanical Brake Co., Ltd. (98,226).—Capital, £30,000 in 2,500 preference and 27,500 ordinary shares of £1 each. Return dated November 9th, 1925. 1,500 preference and 22,500 ordinary shares taken up. £17,965 paid on 1,500 preference and 16,465 ordinary shares. £6,035 considered as paid on 6,035 ordinary shares. Mortgages and charges, £7,500.

Barsi Light Railway Co., Ltd. (44,589C).—Capital, £800,000 in 50,000 preference and 30,000 ordinary shares of £10 each. Return dated October 28th, 1925. 50,000 preference and 26,000 ordinary shares taken up. £759,267 10s. paid. £732 10s. in arrears. Mortgages and charges. £140,000 4 per cent. debenture stock and £114,700 4 per cent. "Latur Extension" debentures (balance of £125,000 issued).

White, Jacoby & Co., Ltd. (52,494).—Capital, £7,500 in £1 shares. Return dated October 9th, 1925. 5,794 shares taken up. £3,437 paid. £2,357 considered as paid. Mortgages and charges, £1,500.

City Notes.

Reports and Meetings of Electrical Companies, Dividend Results, &c.

French Companies.

Negotiations are in progress for the absorption of the works and business of the *Société des Câbles de Lyons* by the *Compagnie Générale d'Electricité*, of Paris.

The *Société Le Fil Dynamo*, of Lyons, has decided to pay out of net profits of 486,000 fr. a dividend at the rate of 20 fr. per share for the past year.

The *Société Industrielle des Téléphones* records profits of 9,236,000 fr. for the past year. The dividend is expected to be at the rate of 50 fr. per share.

The *Société Electro-Câble* reports net profits of 4,460,000 fr for 1924-25, as compared with 4,191,000 fr. in the previous year. In 1923-24 the ordinary shares received a dividend at the rate of 40 fr. per share, and it is assumed that the same rate will be distributed for the past year.

Barbados Electric Supply Corporation, Ltd.

The report for the year ended June 30th last records a trading profit of £10,078, as compared with £9,069 in the preceding year. After charging debenture and loan interest and expenses, and putting £1,000 to reserve for taxation, there remains available a sum (including £1,577 brought forward) of £8,514. Of this amount £5,000 is transferred to depreciation reserve, £2,000 to renewals reserve, and the balance of £1,514 is carried forward. £3,997 was spent on capital account during the year. The growth in the demand has necessitated the extension of the plant; a further 340 kW of Diesel generating plant has been ordered, which will increase the plant capacity to 780 kW. Meeting: December 2nd.

Western Telegraph Co., Ltd.—The report for the year ended June 30th last states that the revenue was £1,472,374 and the working expenses £804,780. After providing for debenture interest and taxation and adding £327,323 brought forward, there remains an available balance of £862,335. The directors have transferred £250,000 to general reserve. Four dividends, totalling 10 per cent., free of tax, have been paid, and a balance of £300,440 is carried forward. The meeting was to be held yesterday (Thursday).

Stock Exchange Notices.—Dealings in the following have been specially allowed by the Committee under Rule 159:—

Auckland Electric Power Board (5 per cent. Water Power Conversion and General Extension Purposes Loan, 1925).—£250,000 5 per cent. debentures, 1946, issued at 98 per cent., partly paid and fully paid.

Richmond (Surrey) Electric Light and Power Co.—163,670 new shares of £1 each issued at 24s., partly and fully paid, Nos. 31,331 to 200,000.

Ferguson Pailin, Ltd.—90,000 ordinary shares of £1 each, fully paid, Nos. 30,001 to 100,000 and 130,001 to 150,000. 60,000 7 per cent. cumulative participating preference shares of £1 each, fully paid, Nos. 1 to 30,000 and 100,001 to 130,000.

Application has been made to the Committee to allow the following to be officially quoted:—

Melbourne and Metropolitan Tramways Board.—Stock and partly-paid scrip for £300,000 5 per cent. stock, 1944.

United River Plate Telephone Co.—152,000 ordinary shares of £5 each fully paid, Nos. 760,001 to 912,000.

Shawinigan Water and Power.—$2,000,000 capital stock.

Companies Struck off the Register.—The names of the undermentioned companies have been struck off the Register and they are thereby dissolved:—

Gibbs Magneto Co. (England), Ltd.
International Dowsing Electric Heating and Appliances Co., Ltd.
Lobito Benguella and Catumbella Electric Light and Power Co., Ltd.
London Electrical Trading Co., Ltd.
Northern Electrical Engineering and Plating Co., Ltd.
Romanac Tramway Construction Co., Ltd.
Tramway (Conduit) Point Syndicate, Ltd.

Swiss Company.—The directors of the *Maschinenfabrik Oerlikon* state that an improvement took place in the activity of the works in 1924-25. At present deliveries often have to be made at less than the cost of production, and at the same time guarantees have to be given which can only be reached by the most careful and precise manufacturing. The net profits for 1924-25 were 1,740,000 fr. as against 1,760,000 fr. in the previous year, and the dividend on the share capital of 16,000,000 fr. is at the rate of 8 per cent., as before.

Belgian Company.—The *Société des Câbleries et Corderies du Hainaut*, of Dour, which has a capital of 4,854,196 fr., reports a net profit of 1,059,854 fr. for the last financial year, as compared with 672,110 fr. in the preceding year. No dividend was paid in 1923-24, but this year a sum of 455,000 fr. is being distributed among the shareholders, this being equal to a dividend of about 9¼ per cent.

German Company. — *Rhenish-Westphalian Electricity Works.*—A profit of 12 million marks is reported for the year 1924-25, permitting of the payment of dividends of 8 per cent. on the bearer shares, and 12 per cent. on the registered shares. The sales of electricity were 58 per cent. above those of the preceding year.

New Issue.—*Electrical Distribution of Yorkshire, Ltd.*—The directors state that the recent issue of 250,000 shares of £1 each was applied for more than twice over.

Parsons Foreign Patents, Ltd.—The net profit for the year ended June 30th last was £2,299. To this is added £456 brought forward, making £2,755. Dividends of 5 per cent. on the ordinary and 22.5d. per share on the deferred shares are being paid, leaving £119 to be carried forward.

Edison Swan Electric Co., Ltd.—A dividend of 10 per cent. (as in 1924) is recommended on the ordinary shares in respect of the year ended June 30th last.

Barcelona Traction, Light and Power Co., Ltd.—A dividend of 1¼ per cent. has been declared on the 7 per cent. non-cumulative participating preference shares.

Power-Gas Corporation, Ltd.—A dividend at the rate of 4 per cent. is recommended for the year ended September 30th last.

Stocks and Shares.

MONDAY EVENING.

STOCK Exchange markets are mainly quiet. Rubber continues to prove the devouring element of money, public attention being largely absorbed by the rush to buy rubber shares on account of the strength of the produce. Other markets are thrust on one side. So are members who try to deal in rubber shares. After being treated like a Rugby football for strenuous hours in the Stock Exchange, and signing innumerable contracts up to nearly midnight, the weekly commentator upon electrical stocks and shares may deem it discreet to apologise in advance for possible lapses in his English.

New issues are well taken where they present attraction. The Lancashire Electric Light & Power Company's offer of preference and ordinary shares was promptly over-subscribed. Allotments are expected to appear towards the end of this week. Applicants who are not already shareholders in the company will receive but modest allotments. Newcastle-on-Tyne Electric new ordinary shares are changing hands freely on the basis of 1s. 6d. premium. Active business is increasing in the Richmond Electrics distributed by the Bournemouth and Poole Company. The price has risen to 7s. 6d. premium, and investment paid up to 8s. premium for the shares.

Bournemouths are easier at 59s. after their steady advance, and the list of London shares is quietly firm. South Londons and Westminsters show small gains. Charing Cross and Bromptons are both slightly easier. Edmundsons rose 6d. to 24s. Yorkshire Electrics at 30s. have hardened.

British Insulated are ½ up, at 3½, thanks to board's recommendation that £333,333 of reserves shall be capitalised, and distributed as ordinary shares in the proportion of one new share for every three old shares held. The new shares will not rank for the interim dividend, but will participate in the final dividend for the year ending next month.

Edison Swans slipped back to 8s. 6d., there being some disappointment at the retention of the dividend, just declared, at 10 per cent. Optimism had looked for 12½ per cent. Siemens have recovered to 35s. 6d. Johnson & Phillips, now ex dividend, stand higher at 58s. 9d. Metropolitan-Vickers have been again in favour by reason of the contracts that the company is securing, and the price strengthened to 27s. Callenders reacted to 3 5/16; General Electric drooped to 29s., although it is said that the company is doing very well in the wireless branch of its business.

Marconis remain at 26s. 3d., and are a languid market. Canadians are dull at 5s. 9d., there being little interest taken in them. Radio Corporations have gone back to 9¾ for common and preferred, New York offering the shares with freedom on account of the recent decline shown in the company's earnings. The South African Wireless Company has signed an agreement with the British Post Office for "beam wireless."

Western Telegraphs are 5s. up at 17½, upon recognition of the shares' cheapness as compared with those of the other parties in this group. The company has declared the usual dividend at the rate of 10 per cent., tax-free, per annum. Anglo-American deferred stock is ¼ better at 24⅛. United River Plate new shares are quoted but slightly under the price for the old. Oriental Telephones are better at 43s. Automatic Telephones keep firm at 2½. Curiosity is excited by a further advance in the ordinary shares of the International Automatic Telephone Company. These are now up to 34s. 6d., notwithstanding the option to buy them, at 30s., held by the American firm of Gary & Co. The advance in price is held to imply some possible rearrangement of the Gary agreement, but nothing is known, up to the time of writing, on this head.

Underground Electric Railways Income bonds are a point to the good at 98, but the rest of the railway market is dull. District, Metropolitan and Central London stocks are down from ¼ to 1. The London traction issues have not changed.

While Mexican Light Common and Preferred are both 2¼ lower, the company's 5 per cent. first mortgage bonds have put on 2 points. Anglo-Argentines exhibit strength; Brazilian Tractions are again a dollar down at 78. In Amsterdam and Berne, issues have been made within the past week of 7 per cent. 15-year bonds of the Berlin municipal electricity works. The Dutch terms were 91¼.

Babcocks are better at 52s., but there is a good deal of irregularity in iron, steel and allied shares. The rise in the price of raw rubber has had no unfavourable effect upon shares in the cable manufacturing group, while it has served to lash the rubber share market into a condition of extraordinary animation, with the usual sequel of physical fatigue to those engaged in dealing.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom. £	Dividend. 1923.	Dividend. 1924.	Price Nov. 23. 1925	Rise or fall.	Yield p.c.
Bournemouth and Poole	1	15	14	30/- xr	—1/-	4 14 11
Brompton Ordinary	1	10	10	1⅛	—⅛	*6 8 1
Charing Cross Ordinary	1	14½	15	2⅞	—1/8	6 3 1
do. do. 4½ Pref....	1	4	4½	17/6	—	5 2 10
Chelsea	1	12	12	2	—	6 0 0
City of London	1	15	15	47/-	—	6 7 4
do. do. 6% Pref.	1	6	6	28/-	—	5 4 4
Clyde Valley	1	8	8	27/6	—	5 16 4
County of London	1	15	15	57/-	—	5 5 2
do. do. 6% Pref.	1	6	6	23/-	—	5 4 4
Edmundson's Ordinary	1	7	7	24/-	+6d.	5 16 8
do. 7% Pref.	1	6	7	21/6	—	6 10 3
Elec. Supply Corporation ...	1	10	10	32/6	—	6 3 0
Kensington Ordinary	5	14	15	13	—	5 15 5
Lancs. Light and Power	1	7½	7½	26/6	—	5 13 2
London Electric	1	10	10	34/-	—	5 17 8
do. do. 6% Pref.... ...	5	6	6	5⅝	—	5 6 8
Metropolitan	1	10	11	38/6	—	5 14 4
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	5½	6	22/9	—	5 5 6
Newcastle-on-Tyne Ordinary ...	1	6	7	22/6 xr	—	6 4 5
do. 5% Pref. ...	1	5	5	18/9	—	5 6 8
do. 7% Pref. ...	1	7	7	24/-	—	5 16 8
Notting Hill 6% Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6% Pref. ...	1	6	6	22/6	—	5 6 8
St. James' and Pall Mall	5	17½	17½	15	—	5 16 8
South London	1	15	15	2⅞	+⅛	5 17 1
South Metropolitan Pref. ...	1	7	7	1¼	—	5 12 0
Urban Ordinary	1	4	4	18/3	—	4 7 8
do. 6% Pref. ...	1	6	6	18/9	—	6 8 1
Westminster Ordinary	1	15	15	45/-	+6d.	6 13 4
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1	—	7 10 0
Yorkshire Elec.	1	8	8	30/-	+6d.	6 6 8

HOME RAILS.

Central London Ord. Assented	Stock	4	4	66	—1	6 1 3
Metropolitan	,,	4	5	70½	—½	7 1 10
do. District	,,	3½	3½	47	—1	7 8 11
Underground Electric Ordinary	10	Nil	Nil	2¾	—	Nil
do. do. "A" ...	1/-	Nil	Nil	8/-	—	Nil
do. do. Income	Bonds	6	6	98	+1	*6 2 5

TELEGRAPHS AND TELEPHONES.

Anglo-Am. Tel. Pref.	Stock	6	6	103	—	5 16 6
do. Def.	,,	1½	1½	24½	+½	6 1 10
Automatic Telephone	1	8	6	9⅞	—	2 6 10
Chili Telephone	5	6	5	6⅛	—	*4 7 0
Cuba Sub. Ord.	10	5	5	6¾	—	7 8 2
Eastern Extension	10	10	12	18½	—	*5 9 7
Eastern Tel. Ord.	Stock	10	10	180	—	*5 11 1
Globe Tel. and T. Ord.	10	10	10	18½	—	*5 9 7
do. do. Pref.	10	6	6	11	—	5 8 1
Great Northern Tel.	10	22	22	34½	—	6 8 6
Indo-European	25	7	8½	45½	—	*4 13 5
Marconi	1	10	10	1⅝	—	7 12 4
Marconi Marine	1	10	7½	8	—	8 11 6
Oriental Telephone Ord. ...	1	12	12	43/-	—1/-	*5 11 7
United R. Plate Tel.	5	8	8	7⅞	—	5 5 10
Western Telegraph	10	10	10	17½	+¼	*5 13 6

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	8⅞	+⅛	7 14 5
do. do. 2nd Pref. ...	5	6	6	8⅞	—	8 14 6
do. do. 5% Deb. ...	Stock	5	5	75½ xd	—	6 12 5
British Electric Traction Ord. ...	,,	6	6	122½	—	4 18 0
do. do. 6% Pref. ...	,,	6	6	106	—	5 13 2
Brazil Traction	100	4	4	78	—1	5 2 7
Brit. Columbia Elec. Rly. Pcs.	Stock	5	5	80½	—	5 11 9
do. do. Preferred	,,	96/-	96/-	98½	—	*4 17 6
do. do. Deferred	,,	129/6	129/6	115½	—1	*5 12 7
do. do. Deb.	,,	4½	4½	77½	—	5 9 8
Lond. & Sub. Trac. 5% Pref. ...	1	2½	Nil	4/6	—	Nil
London United Tram. Deb. ...	Stock	4	4	42½	—	9 8 4
Mexico Trams, 5% Bonds ...	—	5	5	63½	—	7 17 6
Mexican Light Common ...	100	Nil	Nil	31½	—2½	Nil
do. Pref.	100	Nil	Nil	61½	—2½	Nil
do. 1st Bonds ...	—	5	5	71½	+2	6 19 10
Yorkshire (West Riding) ...	1	5	—	18/9	—	5 6 8

MANUFACTURING COMPANIES.

Babcock & Wilcox	1	12	12	53/-	+9d.	*4 12 4
British Aluminium Ord.	1	5	10	1⅛	—	5 6 8
British Elec. Transformer Pref.	1	Nil	7	1	—	... ...
British Insulated Ord.	1	15	15	3½	+⅛	4 0 0
Brush Ord.	1	10	10	25/6	—	7 16 11
Callenders	1	15	15	3½	—1/3	4 10 7
do. 6½% Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	Nil	Nil	13/9	—	... ...
Edison-Swan	4/-	10	10	8/6	—6d.	4 11 0
do. 5% Deb.	Stock	5	5	91	—	5 19 1
Electric Construction	1	10	10	33/9 xd	—	6 6 0
Enfield Cable, Pref.	1	7½	7½	1½	—	6 0 0
English Electric	1	5	5	20/3	—	4 19 0
do. do. Pref.	1	6	6	21/-	—	5 14 3
Gen. Elec. Pref.	1	6½	6½	23/9	—	5 9 5
do. Ord.	1	5	7½	29/-	—9d.	5 3 5
Henley	1	15	16	31½ xd	+2/-	4 11 5
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	5	5	1⅛	—	*4 9 0
Johnson & Phillips	1	10	10	58/9 xd	+1/-	3 6 9
Met-Vickers, Ord.	1	8	8	27/-	+9d.	5 18 6
do. Pref.	2	8	8	2⅜	—	6 14 9
Siemens Ord.	1	—	7½	35/6 xd	+1/6	4 4 6
Telegraph Construction	12	20	20	20½	—	4 10 0

* Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

IT should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances

CHEMICALS, &c		Price November 24th.	Fortnight, inc. or dec
a Acid, Oxalic	per lb.	5½d.	
a Ammoniac, Sal	per ton	£60	..
a Ammonia, Muriate (large crystal)	,,	£62	..
a Bisulphide of Carbon	,,	...	..
a Borax	,,	£25	..
a Copper Sulphate	,,	£25 10s.	..
a Potash, Chlorate	per lb.	4d. to 4½d.	..
a ,, Perchlorate	,,	5½d.	..
a Shellac	per cwt.	£15 15s.	..
a Sulphur, Commercial	,,	£8 10s.	..
a ,, Roll	,,	£8 10s	..
a Soda, Chlorate	per lb.	3¼d. to 3½d.	..
a ,, Crystals	per ton	£5 to £5 5s	..
a Sodium Bichromate, casks ...	per lb.	4d.	..
METALS, &c.			
b Aluminium, Ingots	per ton	£120 to £125	..
b ,, Wire	per lb.	1/9 to 2/6	..
b ,, Sheet	,,	1/6 to 2/-	..
p Babbitt's Metal and Anti-friction Metal—			
Grade I	per ton net	£253	£3 inc.
Grade II	,, ,,	£180	£2 inc.
Grade III	,, ,,	£100	£1 inc.
c Brass (rolled metal 2" to 12" basis)	per lb.	10¼d.	...
c ,, Tubes (solid drawn) ...	,,	1/- to 1/0½	...
c ,, Wire, basis	,,	10d.	...
c Copper Tubes (solid drawn) ...	,,	1/1½	...
c ,, Bars (best selected) ...	per ton	£92	...
c ,, Sheet	,,	£92	...
c ,, Rod	,,	£92	...
d ,, (Electrolytic) Bars ...	,,	£69 5s.	...
d ,, ,, Sheets ...	,,	£14 5s 10s.	...
d ,, ,, Wire Rods ...	,,	£78 5s.	...
d ,, ,, H.C. Wire ...	per lb.	9½d.	...
f Ebonite Rod	,,	2/3 to 2/5	...
f ,, Sheet	,,	2 3 to 2/6	...
a German Silver Wire	,,	1/3	...
h Gutta-percha, fine	,,	9/9	...
h India-rubber, Para fine	,,	4/-	2½d. ine.
f Iron Pig (Cleveland Warrants) ...	per ton.	nom.	...
f ,, Wire, galv. No. 8, P.O. qual.	,,	£12	...
g Lead, English Pig	,,	£37 5s.	30s. decl
g Mercury	per bot.	£14 12s. 6d. to £14 15s.	5s. inc.
e Mica (in original cases) small ...	per lb.	3d. to 8/-	...
e ,, ,, medium ...	,,	4/- to 8/-	...
e ,, ,, large ...	,,	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings	,,	1/3½	...
p ,, ,, drawn bars & rods	,,	1/3	...
p ,, ,, rolled strip & sheet	,,	1/4½	...
p ,, ,, wire	,,	1/4	½d. ine.
c Platinum	per oz.	£26	...
d Silicium Bronze Wire	per lb.	1/0½	...
r Steel, Magnet, in bars	,,	7½d.	...
a Tin, Block (English)	per ton	£282 10s. to £283	£2 10s. to £2 15s. ine.
s Wire, Nos. 1 to 18	per lb	4 3	2d. inc.

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
j Richard Johnson & Nephew, Ltd.
m P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

A Small Hydro-Electric Scheme.—An interesting small hydro-electric scheme has recently been completed at Lunesdale, near Lancaster, for a supply of electricity to Hornby Castle for Mr. H. C. W. Foster. The picturesque stream, Roeburn, has been harnessed to generate the electrical energy. The water wheel of the old mill at Wray has been removed and supplanted by an immersed turbine of 30 h.p., fed from the high dam and from an automatically-filled tank. The turbine is fitted with a flexible coupling and an automatic oil-pressure governor. It has a propeller-type runner, and is complete with guide valves, &c. A 20-kW compound-wound generator is coupled and supplies a three-wire system at 500 V. It is of the two-bearing type, and is equipped with a static balancer to deal with 25 per cent. out-of-balance load. An ironclad switchboard supported on a steel frame carries the necessary distributing switchgear and instruments. The transmission line (53 poles) is 2,700 yards long. The aerial cables run in an approximately straight line to a terminal pole to the east of Hornby Castle. From this pole the line is branched to the castle and to the estate workshops. Immersion heaters controlled by an automatic system, a thermostatic switch operating tappet switches, are installed for water heating in the castle. In the workshops a 25-h.p. B.T.-H. motor is installed, directly coupled to an "Aston" generator for charging the batteries for the lighting supply of the castle and outer buildings. A 15-h.p. motor drives a line of shafting, which operates circular saws, planing machines, &c. It is also intended to electrically equip the laundry, in which a 30-h.p. oil engine is at present installed. The work has been carried out by the Austin Lighting Co., Ltd., Banbury. Tests have given entire satisfaction. It is expected that the village of Hornby will ultimately benefit by the scheme.

Canadian Electrical Imports and Exports.

THE following figures, showing the imports into and exports from Canada of electrical and similar materials during the year ended March 31st, 1925, are taken from the recently-issued trade statistics. Figures for the year 1923-24 are given for purposes of comparison, and notes of any increases or decreases have been added :—

	1923-24. $	1924-25. $	Inc. or dec. $
IMPORTS.			
Copper wire, plain, tinned, or plated—			
Total	67,000	71,000	+ 4,000
From United Kingdom ...	2,000	1,000	– 1,000
„ United States	65,000	70,000	+ 5,000
Copper wire, covered, including cable—			
Total	347,000	341,000	– 6,000
From United Kingdom ...	77,000	33,000	– 44,000
„ United States	264,000	304,000	+ 40,000
Electric batteries, primary—			
Total (mainly from U.S.A.) ...	40,000	24,000	– 16,000
Electric batteries, storage—			
Total	765,000	924,000	+ 159,000
From United Kingdom ...	221,000	334,000	+ 113,000
„ United States	544,000	590,000	+ 46,000
Electric fans—			
Total	70,000	48,000	– 22,000
From United Kingdom ...	1,000	—	– 1,000
„ United States	67,000	47,000	– 20,000
Electric fuses, fuse plugs, and cut-outs—			
Total (mainly from U.S.A.) ...	200,000	163,000	– 37,000
Lightning arresters, choke coils, &c.—			
Total (mainly from U.S.A.) ...	140,000	113,000	– 27,000
Rheostats, controllers, &c.—			
Total	426,000	299,000	– 127,000
From United Kingdom ...	19,000	37,000	+ 18,000
„ United States	400,000	261,000	– 139,000
Sockets, outlets, and receptacles—			
Total	147,000	144,000	– 3,000
From United States	139,000	132,000	– 7,000
„ Japan	8,000	8,000	—
Spark plugs, magnetos, and other ignition apparatus—			
Total	568,000	441,000	– 127,000
From United States	562,000	437,000	– 125,000
„ United Kingdom ...	6,000	3,000	– 3,000
Electric cooking and heating apparatus—			
Total	159,000	118,000	– 41,000
From United Kingdom ...	4,000	1,000	– 3,000
„ United States	154,000	117,000	– 37,000
Dynamos and generators.—			
Total	1,214,000	978,000	– 236,000
From United Kingdom ...	149,000	74,000	– 75,000
„ United States	1,064,000	810,000	– 254,000
Electric light fixtures—			
Total	546,000	546,000	—
From United Kingdom ...	6,000	10,000	+ 4,000
„ United States	520,000	505,000	– 15,000
Electric meters—			
Total	270,000	210,000	– 60,000
From United Kingdom ...	49,000	28,000	– 21,000
„ United States	221,000	181,000	– 40,000
Arc lamps—			
Total (mainly from U.S.A.)	39,000	24,000	– 15,000
Incandescent lamps—			
Total	689,000	386,000	– 303,000
From United Kingdom ...	22,000	6,000	– 16,000
„ United States	107,000	93,000	– 14,000
„ Japan	77,000	65,000	– 12,000
„ Holland	331,000	178,000	– 153,000
„ Belgium	69,000	10,000	– 59,000
Electric motors—			
Total	1,929,000	1,816,000	– 113,000
From United Kingdom ...	108,000	204,000	+ 96,000
„ United States	1,811,000	1,536,000	– 275,000
Self-contained lighting sets—			
Total (mainly from U.S.A.)	67,000	20,000	– 47,000
Telegraph instruments (including wireless)—			
Total	1,044,000	2,655,000*	+1,611,000
From United Kingdom ...	108,000	1,138,000	+1,030,000
„ United States	932,000	2,497,000	+1,565,000
Telephone instruments—			
Total	483,000	303,000	– 180,000
From United Kingdom ...	60,000	27,000	– 33,000
„ United States	422,000	276,000	– 146,000
Switches, switchboards, circuit breakers, and parts—			
Total	1,059,000	949,000	– 110,000
From United Kingdom ...	43,000	38,000	– 5,000
„ United States	999,000	909,000	– 90,000
Transformers—			
Total	382,000	295,000	– 87,000
From United Kingdom ...	6,000	5,000	– 1,000
„ United States	293,000	261,000	– 32,000
Electrical apparatus, n.o.e.—			
Total	3,736,000	3,833,000	+ 97,000
From United Kingdom ...	139,000	172,000	+ 33,000
„ United States	3,571,000	3,541,000	– 30,000

* Imports of wireless apparatus in 1924-5 :—Total $2,500,000, including $1,127,000 from U.K. and $2,355,000 from U.S.A.

EXPORTS.			
Batteries, telegraph and telephone apparatus—			
Total	450,000	314,000	– 36,000
To United Kingdom	133,000	62,000	– 71,000
„ United States	46,000	18,000	– 28,000
„ Newfoundland	17,000	37,000	+ 20,000
„ Australia	53,000	4,000	– 49,000
„ New Zealand	55,000	19,000	– 36,000
Dynamos, generators, and motors—			
Total	20,000	28,000	+ 8,000
To United Kingdom	1,000	4,000	+ 3,000
„ United States	10,000	2,000	– 8,000
„ New Zealand	1,000	146,000	+ 145,000
Electric cooking and heating devices—			
Total	101,000	181,000	+ 80,000
To United Kingdom	2,000	4,000	+ 2,000
„ New Zealand	56,000	146,000	+ 90,000
„ Australia	37,000	21,000	– 16,000
Spark plugs, magnetos, and other ignition apparatus—			
Total	245,000	289,000	+ 44,000
To United Kingdom	108,000	99,000	– 9,000
„ Australia	67,000	73,000	+ 6,000
„ New Zealand	23,000	27,000	+ 4,000
„ British South Africa ...	16,000	16,000	—
Electrical apparatus, n.o.e.—			
Total	1,067,000	771,000	– 296,000
To United Kingdom	698,000	47,000	– 651,000
„ Australia	38,000	8,000	– 30,000
„ New Zealand	72,000	24,000	– 48,000
„ Newfoundland	19,000	327,000	+ 308,000
„ United States	42,000	34,000	– 8,000
„ France	10,000	—	– 10,000
„ Japan	13,000	258,000	+ 245,000
Copper wire and cable, insulated—			
Total	444,000	584,000	+ 140,000
To United Kingdom	—	36,000	+ 36,000
„ United States	2,000	2,000	—
„ Brazil	164,000	99,000	– 65,000
„ British South Africa ...	—	108,000	+ 108,000
„ Newfoundland	21,000	44,000	+ 23,000
„ New Zealand	49,000	64,000	+ 15,000
„ Cuba	123,000	126,000	+ 3,000

The total value of all electrical apparatus, including lamps and fixtures, imported into the Dominion rose from $12,110,000 in the fiscal year ended March, 1923, to $13,977,000 in the following 12 months and $14,289,000 in 1924-25, whilst that of similar apparatus exported fell from $1,884,000 in 1923-24, to $1,582,000 in 1924-25. These totals do not include wire and cable.

Conditions in Canada.—Following upon their American report, Col. Willey (president of the Federation of British Industries) and Mr. G. Locock (assistant director) have contributed some notes on their visit to Canada to *British Industries*. In a number of respects these impressions run parallel to the American report; for instance, it is mentioned that Canadians, in common with Americans, have an idea that this country is "down and out." The extent of American influence is commented on. The business methods of the two countries are similar; means of communication are rapid; American advertisements are constantly before Canadians' eyes; and there are now 1,100 branch factories of American firms established in Canada, with the natural result that such factories turn for their supplies more naturally to their parent country than to Great Britain. In spite of these handicaps there is without doubt a great opportunity for British trade in Canada, since there is a real sentiment in favour of British goods, when they can be obtained on anything like equal terms. It is, however, essential that British exporters should pay attention to quick deliveries, generous terms to their agents, more widespread advertising, and adapt themselves to Canadian conditions. Special opportunities are said to exist in British Columbia.

Marine Radio-Telegraph Apparatus.

Some Comments and New Devices.

By Major B. BINYON, O.B.E., M.A., M.I.E.E.

(*Abstract of Chairman's Address*: WIRELESS SECTION *of the* INSTITUTION OF ELECTRICAL ENGINEERS.)

I AM duly sensible of the responsibility which now falls upon me at a time which, I think, is somewhat critical in the further development of this important section of the Institution.

With the advent of broadcasting it is not unnatural that the demand for an independent institution of radio engineers should again arise. This matter is receiving the attention of your Committee, which has drafted a number of recommendations for submission to the Council of the Institution; it is not in our interests to seek any enlargement of membership at the expense of status.

Marine Radio Apparatus.

There has been no new international legislation since the Radiotelegraphic Convention of 1912, and although the principal powers have introduced national rules to meet new technical conditions, there is urgent need for the co-ordination of such regulations by international agreement. The General Post Office, Board of Trade, and the fighting Services, through committees on which the wireless companies are represented, are revising our national wireless regulations.

Ships spark sets are usually made in three standard sizes: 1½, ½ and ¼ kW, the rating being defined as the power supplied from the motor-alternator to the primary of the h.p. transformer. Modern practice is to supply the transmitter components completely assembled, usually in an iron structure of the switchboard type. The use of an expanded mild-steel protective enclosure is quite satisfactory in most cases, but care in design is necessary with regard to the distribution of the magnetic field from the h.f. inductances, otherwise appreciable losses can be set up.

The principal types of spark-gap in use to-day are the synchronous and quenched gaps. In a paper read before the Section in June, 1922, Mr. Lea dealt with the merits of the synchronous gap and showed that, as a high-frequency generator, it had an efficiency of the order of 70 per cent. He pointed out, however, that the only criterion which is of importance is the ratio of the power used to the signal strength received.

In order to make a comparison on this basis, tests have recently been carried out by my company to compare the two types of spark transmission, and to ascertain their relative merits with what is commonly called i.c.w., the use of which in the mercantile marine is of importance, for it is the only reasonable method by which a gradual transition from the spark system to c.w. can be effected without undue capital loss.

The results show the efficiency of i.c.w. over the spark systems both for signal field strength and audibility. The audibility of quenched gap is singularly poor for the field strength; the synchronous gap gives good audibility with a weaker field strength than either quenched gap or i.c.w., while the last named gives good field strength, good audibility, and good tuning, and the same audibility (on crystal) may be obtained in comparison with a synchronous spark with much less power. If lower receiver decrements were employed, i.c.w. should give even better results on account of its sharper resonance curve.

Power for power, a larger aerial current is obtained with a quenched gap than with a synchronous gap, which is of especial interest in view of a regulation recently introduced by the Post Office basing the range of ships' stations upon the metre-ampere standard. This regulation is very convenient for ship inspection purposes, but by ignoring the factors of audibility and tuning, it definitely favours the adoption of a quenched gap, particularly on the smaller class of ship having low masts and low-power sets. These results are directly contrary to the generally-accepted view that i.c.w. gives poor audibility with crystal reception, but all ships now fitted with c.w. installations also carry spark sets, and more information is urgently needed as to whether i.c.w. can be relied upon to carry out all the functions of a spark transmitter, bearing in mind the receiving conditions aboard other ships.

Lifeboat Installations.

Legislation has recently been introduced for the compulsory fitting of wireless sets of the spark type to ships' lifeboats. There is still a wide difference of opinion whether the petrol engine or the storage battery is the more suitable prime mover; in any case, batteries must be supplied for the filaments and h.p. supply of the valve receiver. The Board of Trade regulations specify that the battery shall be of sufficient capacity to provide for transmission of Morse signals for six hours continuously with a power of 15 metre-amps. in the aerial. The accepted definition of "Morse" load is 60 per cent. of the increase in load produced when the key is pressed.

The quenched-gap system is the most suitable for lifeboat sets; the circuits can be simple and auto-coupled, and the gap needs no adjustment and is unaffected by moderate variations in alternator speed. The Board of Trade regulations require only one wave, *viz.*, 600 metres, with 15 metre-amps. in the aerial. The height of a lifeboat aerial averages from 6 to metres; hence, to obtain 15 metre-amps. an aerial current of not less than 2.5 amps. is required. To attain this current in a very small aerial (the average capacity is 0.00019 mf.) very high potentials are necessary, which considerably increase the insulation difficulties under wet conditions. The aerial potentials (crest value) measured under working conditions are of the order of 40,000 volts.

To test the efficiency of a lead-in insulator, salt water was poured over the set while in operation; the aerial current soon fell from 3 to 2 amps. and steam began to rise from the canvas-covered wood immediately surrounding the lead-in insulator, ultimately the wood dried and charred. These difficulties were overcome by fitting a large metal cowl over the insulator and a flat earthed plate of similar diameter over the woodwork surrounding the insulator.

Reception conditions in an open boat in stormy weather and with a poor aerial are likely to be very difficult, consequently valve amplification is essential. A detector valve followed by two stages of l.f. amplification is a simple arrangement entailing no filament rheostats or other adjustments. If dull-emitter valves of the "peanut" type are employed, the filament current can be supplied from a single cell of the main nickel-iron pattern (1.2 volts), the entire battery (18 volts) being used for h.p. supply; h.p. batteries of the dry-cell type deteriorate too rapidly, when not in use, to be depended upon. Under "S.O.S." conditions extreme selectivity is of no importance.

Characteristics of Ships' Aerials.

The "T" aerial is most generally employed, and is usually convenient as regards the disposition of the down lead clear of other rigging; this form of aerial also enables a lower natural wave-length to be obtained without appreciably reducing the wave-length obtainable when the maximum loading inductance is of the order of 300 mics.

Single-wire aerials are coming largely into favour for the reason that, having no heavy spreaders, the inertia and wind forces are less. For single-wire aerials is is usual to employ a heavily-galvanised steel wire with a hemp core, and tests at sea show that, although the current obtained is less, there seems to be no drop in signal range, as compared with the twin copper-wire aerial.

Regulations still provide that all ships shall be capable of transmitting on 300 metres, but the natural wave-length of aerials in large ships often exceeds this figure; consequently, it is necessary to provide either a series condenser or to split the aerial and lead in the two down leads separately. The expenditure in either case is wasteful since the efficiency of such arrangements is poor, and in practice 300 metres is rarely, if ever, used by large and medium-sized vessels. The continuance of this regulation is, therefore, very undesirable.

The application of the rough formulæ for the calculation of the natural wave-length of a "T" aerial,

$$\lambda_0 = 4\left(H + l/2\right) \text{ metres}$$

is by no means accurate for ships, owing to the disturbing effects of the rigging. Tuning data obtained from a large number of ships all having a uniform type of aerial-tuning inductance indicate that the following approximate constants in the formulæ are more nearly correct:

$$\text{Twin "T" aerials } \lambda_0 = 5{\cdot}2\left(H + l/2\right) \text{ metres}$$

$$\text{Single "T" aerials } \lambda_0 = 4{\cdot}6\left(H + l/2\right) \text{ metres}$$

The porcelain chain type of insulator, if carefully designed, is probably the most satisfactory for marine purposes, though it is heavier and more expensive than either the porcelain rod or rubber strop. It is mechanically very strong and safe in use, and with a properly-designed chain the losses, when employing a 1½-kW c.w. set, should not exceed 15 watts on the most difficult wave-length and with the insulator sprayed with water equivalent to a heavy tropical rain.

Automatic Call Devices.

During 1923 and 1924 the Admiralty, at the request of the Board of Trade, conducted a series of tests with calling appliances submitted by the Post Office, Marconi's Company, and Radio Communication Co. Generally, the trials demonstrated that the long dash call gave too many false calls, and that the most suitable form of signal consisted of a series of dashes of four seconds each, separated by an interval of one second, and that it should be possible to develop apparatus to register 90 per cent. effective calls.

In one type of calling device the telephone terminals of the ship's receiver are connected to a note amplifier and the amplified current is then rectified a second time and passed to a sensitive relay of the moving-coil type; the tongue of this relay therefore follows all incoming signals, whether Morse or the special signal it is desired to select. The timing element of the selector consists of a very simple form of electric motor, the armature comprising a simple iron bar without any windings. The speed is controlled by a governor of the gramophone type, and the motor drives a magnetic clutch through a reduction gearing, the speed of the clutch being two revolutions per minute. When the magnetic clutch closes, it drives an extension shaft on which the selecting cam mechanism is mounted and, if the signal be of the correct type, the clutch is held closed until a final cam operates a contact which rings the alarm bell. If, however, the signal is incorrectly timed, the selector mechanism breaks the clutch circuit, and the cam

shaft is instantly reset to the zero position by means of a spring. A certain amount of latitude in the cutting of the cams allows for slight inaccuracies in sending; an average of only one false call in 500 was registered in the Admiralty trials.

Aural Direction Finding.

The modern tendency in the mercantile marine is to adopt small multi-turn loops, either fixed or revolving, in place of the larger single-wire triangular loops formerly employed. In the Robinson system, in unskilled hands, the 90 deg. ambiguity may be a source of danger unless a preliminary observation be made on one coil only, and a special switch is usually provided to cut out the auxiliary coil for this purpose. In a new device designed to obviate the necessity for any preliminary observation, the reversing switch and operating handwheel are mechanically inter-connected. The handwheel is no longer rigidly connected to the spindle carrying the coils, but drives the coils through a coupling that permits a certain amount of backlash (say, one degree of arc). This backlash in no way affects the accuracy of bearings, since the indicator dial and coils are rigidly fixed on the same shaft.

The relative motion of the handwheel and shaft is utilised to operate the reversing switch, and, if the leads to the switch are connected in the correct sense, the device operates in the following way: The signal from the distant station is heard on the 'phones and the handwheel moved to and fro to the extent of the backlash; this operates the reversing switch. Generally, the two positions give unequal signals. The operator turns the handwheel in the direction giving the weaker signal, and *continues turning it in that direction*, thus turning the whole system. He then is driven away from the "90 deg.-out" bearing towards the "correct" bearing. After he has turned a few degrees, he again moves the handwheel to and fro and judges the relative signal strength. He again rotates the system in the direction corresponding to the weaker signal, and after a few attempts gets a balance. The "correct" bearing is now indicated by the pointer on the dial.

Visual and Automatic Direction Finding.

Any aural system depends to some extent on the personal element, and in consequence varying results may be obtained. A system, at present only in experimental form, has been devised to give a direct *visual* indication of the balance. The method is based on the principle that when an a.c. with a small d.c. superimposed on it is passed through a d.c. moving-coil galvanometer of sufficiently slow period, the galvanometer will show the value of the d.c., and more particularly will show when the d.c. reaches a zero value.

The standard Robinson system is used, but the reversing switch is replaced by a special motor-driven commutator that has two functions: To reverse the (i) relative connections of the main and auxiliary coils, and (ii) rectified output from the amplifier to the galvanometer in synchronism with (i). If we suppose, first, that the commutator is at rest and the coil received, the galvanometer will show a deflection of, say, 10 deg. due to the rectified signal current from the amplifier. system is in the position of balance, and that a signal is being On turning the commutator through 180 deg., the "Robinson" reversal is carried out, and the current through the galvanometer is also reversed. Since we supposed that the coil was in the position of balance, the galvanometer will again read 10 deg. in the opposite direction.

If the commutator is now run sufficiently fast, the galvanometer will not be able to follow the alternation of direction, and will stay at zero. If we now suppose that the coil system is turned so that a balance is not obtained, the galvanometer will receive more current in one direction than in the other, and will be deflected from zero. Therefore, if the coil system is rotated until the galvanometer pointer is at zero, the coil system will indicate either the correct, or the "90 deg. out" bearing.

The elimination of the "90 deg. out" bearing is done in a way similar in principle to the device described above, namely, by correlating the movement of the galvanometer pointer with the movement of the operating handwheel. The great advantage of the visual indicator method is the speed with which really accurate bearings may be taken, and that little or no previous practice is necessary. In the case of a man who has never worked a d.f. set before, the galvanometer method will give an accuracy of plus or minus ¼ deg., as compared with plus or minus 2 or 3 deg. by the aural method.

By replacing the galvanometer with a sensitive relay of the moving-coil type, a series of interesting developments are possible. The relay may be made to light one of two lamps, showing whether the coil system is to be turned to port or starboard. In aircraft, employing fixed coils, an indicator of this character should prove of value in enabling the pilot to "home" on a ground station by watching two lamps on his dashboard. If the relay is made to operate a reversible motor, or a magnetic clutch mechanism with a reversing gear, the d.f. coils can be made to turn automatically in the direction of the correct bearing.

The accuracy of any d.f. observations is affected by interference, and in the case of aural methods any interference is at once apparent to the operator. In the case, therefore, of any visual indicator or automatic system it would be necessary to provide also an aural indicator which, in the case of a ship's installation, might take the form of a loud speaker, in order that the observer may know if any interference is present and also for the purpose of identifying the transmitting station whose bearing is being observed. I believe, however, that when an efficient system of i.c.w. beacon station is introduced operating upon a wave-length of 1,000 metres, troubles from interference will largely disappear, particularly as ranges in excess of 50 miles are not generally required.

The British Electrical and Allied Manufacturers' Association.

Annual Dinner.

On Thursday last week the British Electrical and Allied Manufacturers' Association held its annual dinner at the Connaught Rooms, London. The Earl of Derby (President of the Association) was to have taken the chair, but unfortunately was unable to be present owing to the sudden death of his uncle. Col. R. K. Morcom, C.B.E. (chairman of the Council) presided in his stead, and at the commencement of the proceedings read a telegram from Lord Derby expressing his deep regret at his unavoidable absence. A telegram of condolence was sent to him from the company.

There was a large attendance of members and guests, numbering about 600. Amongst the distinguished guests were Lord Weir of Eastwood (Vice-President), Sir Philip Cunliffe-Lister, K.B.E., M.C., M.P. (President of the Board of Trade), Lt.-Col. Wilfrid Ashley, M.P. (Minister of Transport), Sir Benjamin Longbottom, Air Chief Marshall Sir H. M. Trenchard, Bt., G.C.B., D.S.O., Major-General Sir Philip A. M. Nash, K.C.M.G., C.B., Eng. Vice-Admiral Sir Robert B. Dixon, K.C.B. (Engineer-in-Chief of the Fleet), the Hon. Sir Charles A. Parsons, K.C.B., F.R.S., Sir R. L. Wedgwood, C.B., C.M.G. (General Manager, L.N.E.R.), Dr. S. Z. de Ferranti, Sir George Sutton, Sir Vincent L. Raven, K.B.E. (President I.Mech.E.), Sir Joseph Cook, G.C.M.G. (High Commissioner, Australian Commonwealth), Mr. J. S. Smit (High Commissioner, Union of South Africa), Sir Robert A. Hadfield, Bt., F.R.S., Sir H. A. Walker, K.C.B. (General Manager, Southern Railway), Sir Archibald Denny, Bt., Sir Philip Dawson, M.P., Mr. R. A. Chattock (President, I.E.E.), Sir Harry Haward and Mr. S. L. Pearce (Electricity Commissioners), Mr. W. McClelland, C.B., O.B.E., Mr. W. O. Smith, Mr. W. L. Hichens, Sir Joseph E. Petavel, K.B.E., F.R.S., and Mr. H. J. Ward (President British Engineers' Association).

After the toast of "The King," LORD WEIR OF EASTWOOD proposed "The National Development of Power Resources." Referring to the Committee of three (of which he was chairman) he remarked that the Government had not yet published its report, and he could not disclose its contents, but he did not know why it should not be published at once, nor did he know to what extent the Government would adopt the report or when it would deal with it. Nothing could be worse for industrial development than a state of uncertainty. He said he would forget the report and give his own views on the subject of the toast. He thought that the effective development of our national power resources would be ruined if the question became a political issue, or was considered from a narrow point of view. Efficiency and economy should be predominating considerations. They must look forward to the main energy requirements of the country being filled by electricity because of its potentially low costs and its applicational advantages. As yet electricity was much too expensive, and we did not use half enough of it; moreover, it should be made much easier to obtain a supply. We appeared to possess inherent possibilities of supplying electricity at a cheaper rate than any other country. Scotland and Wales possessed considerable natural resources in the shape of water power, of which the fullest possible advantage must be taken, but the main asset of the country was coal, and our real development problem was to find how best to conserve our fuel resources and convert them into electrical energy economically, and then how to make it available everywhere.

There was a dangerous illusion prevailing that British industry could regain prosperity through a drastic change in electricity supply. Prosperity could not be regained either in that way, or by legislation. A new sense of responsibility and a new unity of national effort must play the larger part, but efficiency in industry and reduction in the cost of production demanded the most efficient and economical service, and in that capacity electricity held pride of place. The problem could not be solved by any scheme involving the immediate erection at the pit-heads of giant stations using low-temperature-carbonisation processes. No one knew enough about that subject to do it on a commercial scale as yet, and we could not afford to do it experimentally. He fully believed in the pre-treatment of coal, but until much more had been discovered it was futile to speak of its immediate application to electrical development. Nevertheless any new electrical scheme should be so devised as to enable the pre-treatment of coal to be dovetailed into it when the time arrived. It was more immediately ne-

cessary and important to utilise waste heat, and any new electrical scheme should provide an open market for the sale of electrical energy generated by this means. Hitherto electricity had been generated only to meet local demands, but it could be produced cheaply as a by-product if a market were provided for it by interconnecting lines. Any change that was made must recognise the valuable work done and the progress made by the great municipalities and power companies; the enthusiasm and activity of those bodies must be conserved and developed. No sound scheme could fail to deal with the existence and continued growth of many small undertakings which every real electrical engineer would sweep away if he could.

The economics of generation were altogether different from the economics of transmission and distribution. Greater legislative freedom should be accorded to transmission and distribution, which had suffered from harassing legislation that increased the cost of electricity to no purpose. The purchase clause must be reviewed, wayleaves made easier to obtain, and overhead transmission lines encouraged. They must have recourse to common sense and give practical encouragement to the undertaker.

Turning to the question of standardisation of frequency, he was a convinced advocate of the earliest possible adoption of a standard frequency, even though it should involve substantial national expenditure. It opened out new possibilities and new freedom to develop. To the manufacturer it secured simplification and lower cost of production: to the user it meant cheaper apparatus and increased confidence in the use of electricity. The opportunity of standardisation was fast disappearing, for the cost of the change was constantly increasing. The opponents of the change could justify their opposition if the view that was taken was short enough—if they considered the conditions in a single area only; but he appealed for a national view of the matter to be taken.

He would prefer to see less money spent on the counter-propaganda of gas and electricity and more applied to teaching the consumer to use them both more efficiently. Both products were real public utilities, and such services should be efficient. Gas and electricity differed in respect of generation, for gas could be stored, but electricity could not. If gasholders were abolished he was sure the gas manufacturers would readily appreciate the value of Government help to interconnect their works.

It was not justifiable to make radical changes in electrical development unless the Government and the people had complete faith in the future of this country. Given that faith, the Government should put electricity in the best possible position to serve the country under the conditions of restored industry and higher standards of living that would obtain in the future. We were only learning how to use electricity, and should plan to-day for the best use of electrical energy 10 years hence. We had unique coal resources and a small and densely populated country, potentially offering the best possible conditions for the development of electrical energy. We had excellent municipal authorities and supply companies, and manufacturers who in the past had fought the hardest fight ever seen against the competition of foreign plant, and they could now deal with any plant requirements. In the B.E.A.M.A. they had an Association of unique value, and a president of whom the whole country was proud. To these assets let them add wider legislation, freedom, and co-ordinated effort; then our country need be in no doubt as to the successful development of our power resources.

Responding to the toast, Lt.-Col. ASHLEY (Minister of Transport) on behalf of the Government, expressed its indebtedness to Lord Weir and his colleagues for the care with which they had prepared their report at great personal inconvenience. The report was admirable for its lucidity and insight, but contained a good deal of explosive material, and it was not advisable to publish it just yet. However, the author had laid bare its minutest details! It had received, and was receiving, most careful attention on the part of the Government; a measure of this importance must not be hastily decided on, for one false step might do damage for generations to come. He hoped that a decision on this vital matter would be announced before Christmas. He knew that the delay was hanging up business, and the sense of that gathering would not be forgotten. The Government highly appreciated the work done by the B.E.A.M.A. for the electrical industry; it had given valuable help during the war, and its collective exhibit at Wembley last year was the finest in the Exhibition. The World Power Congress which it organised was also a distinct aid to industry.

They were all indebted to the Electricity Commissioners for the work that they had done under very difficult circumstances. It was well known that the powers that they possessed were not those that they were meant to have, but with such powers as they had, with the aid of persuasion (which was not very effective without a big stick in the background), they had done splendid work. If they had accomplished nothing else but the London electricity scheme, that alone would have justified their existence. It was of no use to look forward to great development without faith in the future. He himself had the fullest confidence in their future as a commercial nation. Unemployment was decreasing, and the demand for electricity was increasing; as electricity was the hand-maid of industry, that indicated that trade was on the upward grade. Anyone must be blind who could not see that electricity in the future would be the great agent for domestic services. It would help the housewife; it would remove the pall of fog—help hospitals—help agriculture—make travelling more comfortable—and he hoped the railway companies would in the near future see the desirability of following the example of the Southern Railway and would electrify not only the suburban but also the main railway lines. He would repeat that he was fully sensible of the necessity of forming an early decision. The Government was working at it literally every day. Finance was of vital importance; in the present state of the nation's finances, it was not easy to find such sums as might have been put down in the report, but he hoped these difficulties would be overcome.

The toast of "Our Guests" was proposed by Col. R. K. MORCOM, who said he was glad to see four High Commissioners present, and hoped they would develop the "B.E.A.M.A. habit," and never look beyond its ranks for the fulfilment of their requirements. The Government Departments, which realised that the B.E.A.M.A. was out to help them, were well represented; the supply and consulting branches of the industry were also present in force, and he looked to them for increases in the order book and moderation in their specifications. There were many other eminent men, and members of trade associations and technical institutions in the fullest sympathy with their spirit of co-operation. Lastly, there were the great railways, which they hoped each year to bind more closely to the electrical industry, for the benefit of both parties.

Sir PHILIP CUNLIFFE-LISTER, responding to the toast, said the gas industry was the only one left to him now, but he would be the last to under-rate the possibilities of electricity; they were both vital to the future interests of this country, and it would be a most fatal mistake on the part of either to pretend that it could completely supplant the other. There was an ample field for both; they were complementary to each other, and the closer the two industries could get together the more successful both would be, and the better it would be for this country. He still retained a close interest in the future of the Association, and of the industries combined under its ægis; they were all grumblers, but he thought the times were not too bad for electricity. He congratulated them on the co-operative spirit prevailing in the electrical industry, which had enabled them to combine effectively. They were not afraid to collect the power engineers of the world at Wembley last year, and to learn from them and teach them, individually and collectively. The Association was a great pioneer of research, which was the key to success in competition. By conviction and faith he was an optimist as to the future of British industry. Immense mischief had been done abroad by those who pretended that Britain was unable, and was not certain to surmount all her difficulties. The feeling of optimism was justified by such positive factors as the Pact of Locarno, in which the world had turned its back on war, and the great harvests throughout the world. It was up to everyone, personally, to give a push to British trade, and to help the revival of British industry by buying British goods. They should also promote the British Industries Fair, and support the British Shopping Week, which he hoped would become an annual event. By "British" he meant the whole of the British Empire; it was the help from within the Empire that had pulled us through the past crises, and the future was not only hopeful, but certain. He was sure that we had reached the turning-point.

Sir R. L. WEDGWOOD referred to the recent celebration of the centenary of the railways, and speculated as to the character of the next centenary, when perhaps Sir Vincent Raven's electric locomotive would be towed out of a museum for exhibition. It was exactly 21 years since the first steam railway (not an urban railway) was converted from steam to electrical operation. That was the North-Eastern Railway on the Tyneside; the Lancashire and Yorkshire Railway followed three days later. Progress in this country had been slow and limited. No case had yet arisen where the economies to be effected by electrification had been the primary reason for adopting electric traction; that was the problem to be solved—then the electrification of the main lines must follow speedily. The deciding factor was the voice of the sleeping partner of industry—coal; so long as coal was cheap, the steam locomotive would hold its own, except for suburban services. In other applications of power, electricity was driving steam out of the field, and was the motive power of the future. Electrical manufacturers could look back on a year of reasonable prosperity, and forward to one equally promising.

Major-General Sir PHILIP NASH, rising to propose the toast of the "Chairman," expressed his regret at the absence of Lord Derby, but felt that he could not recall a B.E.A.M.A. dinner that had been more successful than this one. He was sure that things were going to improve—and very shortly.

Responding, Colonel MORCOM said it was a great pleasure to hear so many speakers full of optimism. They had to make the B.E.A.M.A. universally acceptable by living up to a great ideal. The President—whose absence was regretted—was a good sportsman. That was the highest praise one could wish for; it implied three ideas: to give a square deal, to be considerate to others, and to be loyal to themselves. They should remember those three criteria. Among certain people the B.E.A.M.A. was unpopular; not all its members were always loyal to the Association. They should see that all the members of their staffs were loyal, and that every buyer should be able to say that the B.E.A.M.A. always gave him a square deal. It was most important that it should be respected, and that could only be done by its being respectable. Then the B.E.A.M.A. would progress, our electrical industry would become the greatest in the world, and the B.E.A.M.A. the greatest Association the world had ever seen.

Assisted Wiring Schemes.

The Second E.D.A. Conference.

ASSISTED wiring schemes formed the subject of a paper by Mr. James Edgar, of South Shields, at an E.D.A. Conference, held on November 20th. The paper gave details of a scheme which the author had put into operation in South Shields recently, and in the discussion which followed, information with regard to other schemes in operation in various areas was given. Mr. R. P. Sloan (Newcastle-upon-Tyne Electric Supply Co.) presided.

Mr. EDGAR said that, whilst supply engineers would continue to explore the industrial field for further power users, the future of the supply industry depended to a very great extent upon the expansion of the domestic load. His scheme was a simple one. Canvassers employed by local contractors approached prospective consumers, and were supplied with a number of forms containing agreements for signature by both tenant and landlord, the canvassers being paid on commission by the contractors. When forms were completed the contractor was given an official order. No initial charge was paid by the prospective consumers, and the contractors were paid by the Corporation at rates which had been mutually agreed upon, after the installation had been tested and passed. The prices paid to contractors were: for a 7-point installation, 17s. 9d. per point; for a 6-point installation, 18s.; 5-point, 18s. 6d.; 4-point, 19s.; and for all below a 4-point installation, 19s. 6d. In addition, 10s. per installation was allowed for supplying and fixing a double pole ironclad switch and fuses. The installations could be carried out in v.i.r. cable drawn into grip steel conduits, or, alternatively, in metallic-sheathed cable on the surface. All materials used must be of British manufacture. At present, installations were limited to six lighting points and a plug, and covered everything up to and including lamp holders, but the lamps and shades were provided by consumers. A prepayment penny-in-the-slot meter was installed, and the charge was the flat rate charge per unit for lighting for the time being in force, plus twopence per unit for all energy consumed up to a consumption of 150 units for each £1 of capital cost of the wiring installation. The present flat rate for lighting purposes was 4½d. per kWh, so that consumers under this scheme paid 6½d. per kWh.

The first applications were received on May 12th this year. The number of private dwelling houses connected at that time was 3,434. At the end of six months from the inception of the scheme, 7,477 applications had been received, the total to date being over 9,000, of which 1,870 would eventually be connected to mains which existed prior to the adoption of the scheme; 26.25 per cent. of the applications were for three-light installations. The number of consumers connected to date was 2,950, and it was anticipated that by March 31st the number connected under the scheme would approximate 6,000.

The "service density" (*i.e.*, the ratio of the number of consumers connected to the number of potential consumers) in 24 streets which he had selected at random, averaged 13.8 per cent. before the scheme was introduced; this had increased to 50.5 per cent. The average consumption per consumer for the quarter ended September last was slightly over 17 kWh, and he assumed that the average annual consumption would be about 130 kWh. The average cost of an installation, including meter, was £7 18s. 0½d., on which the annual interest and sinking fund charges, based on a 10 years' life at 3½ per cent. sinking fund and 4½ per cent. interest, amounted to £1 0s. 7d., or, over the period of 10 years, £10 5s. 10d. The average consumption was estimated at 123.6 kWh per annum, producing, over a period of 10 years, at twopence per kWh (the extra charge in respect of the wiring and meters), £10 6s. Results to date showed that this average consumption would be exceeded. The capital to be expended on mains was estimated at £17,000, whilst the cost of 6,000 services was estimated at £18,000, a total expenditure of £35,000, the capital charges on which would amount to £2,800, equivalent to 0.88d. per kWh sold. The estimated total cost per kWh sold was 1.561d., leaving a net surplus of 2.939d. per kWh. Several consumers who had had their premises wired for lighting under this scheme had since installed heating circuits at their own cost.

Discussion.

In opening the discussion, the CHAIRMAN gave particulars of a similar scheme adopted by the Newcastle-upon-Tyne Electric Supply Co. towards the end of last September, which had worked satisfactorily so far. A year prior to the commencement of the scheme, consumers were connected at the rate of 200 per month, but applications for connection were now being received at the rate of over 1,000 per month, and he hoped that that rate would be materially increased as the scheme developed and became better known. There was a prepayment scheme, but consumers had the option of paying a straight rental; he was strongly in favour of the latter system.

Mr. EDGINGTON (West Ham) asked what was the position if a consumer vacated premises, and the incoming tenant did not wish to continue to take electricity. The cost of installation in South Shields was apparently far below the London cost.

Mr. HOWARD SMITH said that the scheme was not very favourable to the contractor. He urged that in the adoption of these schemes the supply authorities should work with the contractors.

Mr. W. E. ROGERS (West Ham) said that the figure of £3 per service in South Shields was low, but he assumed that there was more than one installation connected to each service. He asked on what terms money was borrowed to carry out the work.

Mr. ABBOTT (Shropshire Electric Power Co.) said his company could not lay a service for £3. Capital charges on generating plant were likely to be heavy in the case of a small undertaking, and he suggested that Mr. Edgar's figures would not show much profit. His company had found that it paid to wire for three lighting points and one plug point free in some cases, and many consumers paid for extra points.

Mr. PAGE (W. T. Henley's Telegraph Works Co., Ltd.) said that a contractor in one district found the conditions very much against him as compared with another district, and it seemed to him that electricity was handicapped by this lack of uniformity.

Mr. MARSDEN (Sevenoaks) asked if there were any limit to the rateable value of the properties in which assisted installations were provided; whether there was any limit of distance from the main to the house; and whether the consumers were given the option of having a sixpenny or shilling meter installed. Where the cost of mains in such a scheme was excessive, part of the revenue should be allocated to this object.

Mr. HOWELL (Battersea) referred to a scheme started recently by his undertaking. The minimum number of lights in any house was six, complete with lamps, shades, switches, and so on. There was a standing charge of 16s. 3d. per quarter, inclusive of the cost of installation and meter rent, and 1d. per kWh consumed. The installation became the property of the consumer in ten years.

Mr. PINKNEY (Newcastle-upon-Tyne Electric Supply Co.) advocated that lamps should be supplied with assisted installations; it was a mistake to encourage people to get their first taste of electric light with carbon lamps, which could be bought cheaply. Apparently, Mr. Edgar did not employ registered contractors, and it seemed, therefore, that supervision must either be expensive or inadequate. Registered contractors should be employed. The contractor was able to increase output, and obtain prompt payment from a "gilt edged" purchaser so that, with short credit and certain payment, he was encouraged to organise for big business. By carrying out installations on a large scale, he could also reduce overhead charges, and reduce prices. He urged accessory manufacturers to organise properly on mass production lines, in order to reduce *their* prices.

Mr. W. E. BUSH (E.L.M.A.) calculated that, if 500 of the 560 supply undertakings in the country had put schemes of this nature into operation, each installation using an average of 3½ lights, the business which would result to the electrical industry would amount to £25,000,000 in six months; that indicated that supply engineers had the prosperity of the industry very much in their own hands.

Mr. F. SELLEY (Marylebone) advocated the employment of contractors for hire purchase and free wiring schemes. In a block of 540 artisans' flats which were wired on the hire system in Marylebone, over 400 were connected in 18 months. In 303 flats using electricity for lighting only, the estimated consumption for 12 months was over 26,000 kWh, and in 114 using it for lighting, heating and cooking, the estimated consumption was over 178,000 kWh. Slot meters were installed, the rate for lighting only being 7d. per kWh, 2d. going towards the cost of the wiring. There was also a "telephone" system of charging for "lighting and other uses," with an inclusive quarterly rental charge varying for two, three, and four-room flats, the rentals being 10s. 10d., 14s. 4d., and 17s. 9d. respectively, plus 1d. per kWh consumed. There was another system of wiring by hire purchase. The Electricity Department obtained competitive prices from contractors and added a percentage—never more than 15 per cent.—thus giving the consumer the benefit of the lowest tender.

Mr. V. A. HITCHMAN (County of London Electric Supply Co.) asked Mr. Edgar if he really thought that 2d. per kWh extra would cover the cost of wiring; as time went on he would probably find that maintenance was a big item.

Mr. LEON GASTER (Secretary, Illuminating Engineering Society) urged that, when a system of assisted wiring was introduced, the method of lighting should be good. He advocated dispensing with meters, and charging a flat rate per lamp. With regard to contractors, he mentioned a system which prevailed in some foreign countries, whereby registered contractors deposited £50 with a local organisation, and if they did not carry out good work they forfeited that sum and lost business.

Mr. L. G. TATE (Secretary, Electrical Contractors' Association) said the bulk of his members realised that hire and hire purchase powers could only be exercised by supply authorities, who could make their profit on the electricity sold. He and his Council realised that, to compete with a gas cooker, an electric cooker had to be hired at a price which was unremunerative to anybody depending simply upon the hire charge. The only point of difference between supply authorities and contractors was as to who was to carry out the installation work, and if the supply authorities would say that they would only employ registered contractors, the contractors would be only too pleased to support them, as they were supporting Mr. Edgar in South Shields.

Mr. ALABASTER (Bermondsey) said that a system of free wiring had been in force in Bermondsey since 1923, the installations being carried out by direct labour. The charge to the consumers was 3d. per kWh above the ordinary price, 2½d. of this being in respect of the installation, and ½d. in respect of meter rent. The supply authority supplied lamps and shades, and replaced burnt-out lamps. He asked what would be the extra cost of the service if South Shields consumers wanted more than six points.

Mr. H. T. YOUNG (Messrs. Troughton & Young) said that it was better that installation work should be carried out by contractors rather than that the supply authority should do it, because the British public were prejudiced against monopoly, and a prospective consumer, if he had no alternative than to go to the supply authority, would probably not bother at all. A fixed charge per quarter encouraged consumers to use more apparatus, and an alternative system, such as that referred to by Mr. Howell, might be offered to consumers.

Mr. C. W. SULLY (E.I.M.A.) suggested that the E.D.A. might call the various interests together to consider these schemes in detail, and collect data for the guidance of those adopting assisted wiring schemes.

Mr. EDGAR then replied to the discussion. With regard to the figure of £3 per service, he said that in many cases he was able to connect four consumers to one service cable, and, in a great many other cases, two consumers. The figure was £3 per consumer, not £3 per service. It was his intention to take up cooking and heating when the work in connection with lighting had slackened down. He had not yet found a case in which a new occupier had refused to take over the installation. The risk was very small. He assured Mr. Howard Smith that the electricity department in South Shields was only too anxious to work amicably with the contractors; all the installations in South Shields were very carefully tested during progress and on completion. Up to the present no money had been borrowed for the scheme. The Corporation had used a special reserve fund inaugurated four years ago. Application had been made to the Electricity Commissioners however, to borrow £10,000, and application would be made for a further £10,000 later. He believed that the period of the loan would be ten years. He did not agree that the cost per kWh should include capital charges on the generating plant, because the generating plant was already there, and there must be sufficient overload capacity or standby plant to meet all the load which would arise from these comparatively small consumers for some time to come. There were only the extra generating costs and distribution costs. He took no account of the rateable value of the properties which were wired under this scheme. As to the limit of distance from the main, he said that the tenemented property adjoined the footpath, and it was only necessary to run from the footpath straight in to behind the front door. The Corporation laid a new distributor along any street provided it was satisfied that the revenue would equal at least 20 per cent. of the cost of laying the cable. If a shilling-in-the-slot meter was desirable, and was asked for, it was installed instead of the penny-in-the-slot meter. When the scheme was started there was only one registered contractor in South Shields, but he believed many had now applied for registration. Out of approximately 3,000 installations connected there had been a very small number of installations condemned because the insulation resistance was not sufficiently high. He agreed that the number of orders placed in the hands of contractors should have a tendency to reduce the price per point.

He had not found it necessary to follow up the consumers in order to sell irons, because a very large number were purchasing irons themselves. The manager of the local Co-operative Society, which had an electrical department, had agreed to allow its members to have such apparatus as electric irons on easy-purchase terms, and the plan had been very successful. Since the commencement of the scheme, in May, the Corporation had paid the local contractors over £15,000, and he had recently got his Committee to certify another £3,000 to £4,000 for a month's work. He agreed that two systems of charging might be advisable, but the scheme he had introduced was rather too young to justify experiment at this stage, and perhaps after twelve months' working the question of introducing some other system of charging might be considered.

The Engineer and his Duty.

His Due and his Duty in Life.

(*Abstract of paper read before the* INSTITUTION OF ELECTRICAL ENGINEERS.)

MR. T. CARTER, M.I.E.E., commences his eight-page paper with an outline of the rights and duties of life; having reminded his hearers of what an engineer is, he asks how the life of an engineer may have its fullest usefulness. The author maintains that we have not long begun to realise how much a problem like this concerns us as a nation. We make far too little attempt to ascertain whether those who decide to be engineers are real engineers; we also let many escape into other occupations who should be compelled to come into engineering. The finding of engineers to train is far more important than the finding of methods of training them. Strictness at the beginning may reduce the number of those who become engineers; but that is what is needed. The proper selection of potential engineers and the rejection of all others would so increase the efficiency of the profession that there would be no lack of directing ability. To keep its place in the world, a nation must more and more cherish and utilise every one of its members to the fullest of his possibilities.

In pursuit of our aim, we must discover the inmost nature of children at an early age, and it may be hoped that teachers will more and more try to do this as part of their work. Tests of intelligence and vocational tests are being made tentatively in many places, both of children still at school and of those passing out into employment, and suggestive information has already been collected. By checking attainment against prediction, thus keeping abreast of each child's development, it will eventually be possible for the head of a school to give definite advice regarding the career of at least some of his scholars.

Dr. Johnston, of Highgate School, keeps records of all boys, even those of average capacity, which are systematically studied as they go through the school, so that they may be guided into appropriate callings. Dr. Johnston writes: "There are two ways in which help can be given: first, and in practice more important and helpful, though it is on the negative side, we are able to inform parents with great confidence what form of activity the boy should *not* attempt, and I have always advised parents to let no boy become an engineer unless he combines in his capacity two particular forms of talent: (*a*) real aptitude in dealing with scientific apparatus and adapting means to ends, and a real feeling for the purpose of machinery in general; and (*b*) distinct capacity in the practical applications of mathematics and the use of mathematical formulæ for utilitarian purposes. If he has higher mathematical knowledge and could deal with the abstractions of theory, so much the better, and he might become a better and greater designing engineer. . . .

"Secondly, on the positive side, I have found it possible to do a certain amount, but not very much. Of the many positive suggestions that are given, all valuable in some way, 20 or 30 per cent. yield important results."

The very facility with which we may pick up a smattering of a subject nowadays, and the ease with which a thin veneer of showy knowledge is spread over great slabs of essential ignorance, may lead us back to the conditions of the dark ages, if we are not careful. If we are to apply our knowledge to the best advantage in our practice, we must keep it as varied as we can, consistently with thoroughness; in addition, we must try to acquire the wisdom that will show us how to use it. Luck is often nothing else than a readiness for the coming chance, and an immediate grasping of it when it arrives.

One of the most remarkable things about engineering is that there is scarcely a region of the world's activity into which the engineer's direct influence does not extend. The contrivances of engineers having made so much possible and even inevitable, must not they now, when they see the monster that has been created, design some new contrivance that will so mollify and tame it that the world may once again be safe?

On the whole, engineers have not taken much part hitherto in public life; many of them are by nature not fitted for it, though that is not to say that all who are in it now are pre-eminently suitable. Some engineers, however, in addition to their technical accomplishments and their ingrained habits of reflection and investigation and logical deduction, have so clear a view of what is wrong in affairs generally, and of what may have to be done to put it right, that they ought certainly to be in positions of wide authority, dealing with public problems not merely as engineers, but as men of the world with special qualifications because they are engineers. The way out of the turmoil will only be found by patient thought and long consideration and conference, and the public-minded engineer is peculiarly well suited for this. Parliament cannot do much to devise remedies; its main province is to register in its Acts the state of public opinion at a given moment, and thus to create conditions favourable to progress along desired lines; and it is for those who are faced by any problem to work out a solution for it, and then, convinced that they have found it, to go and ask Parliament to sanction it. If some engineers were also members of Parliament and of other great deliberative bodies, many problems would be passed into practice with increased effectiveness, and the whole outlook of public life might be redirected for the better. Thus would full usefulness be reached in service to the nation; engineering would become a still finer thing than it is; and the life of an engineer would be more desirable because his work would be more highly appreciated.

Discussion in London.

Mr. J. SWINBURNE, F.R.S., opened the discussion with some interesting remarks on the subject of education, of which a clear definition was, he said, needed. The four essentials were to teach a boy, first, to earn his own living; then hygiene, &c., in order to keep him physically fit; thirdly, to be a good citizen; and, fourthly, how to amuse himself, so that he would not become dissatisfied. In Ancient Egypt they had some excellent engineers, and wonderful astronomers, but they were all priests, and down to this day education was influenced by them. Public school headmasters were often made bishops. Why was not the President of the I.E.E. made a bishop? Modern education retained many features of ancient education; scholars were not taught to help themselves to think, and the whole system was based on memory; things were taught because authorities had said that they should be taught. A university educated man knew nothing, and he could not earn his own living, because he was taught things that would be of no use to himself. Engineering was nothing but common sense and physical science also. An engineer was a man who "thinks straight"; engineers should not confine their logic to themselves; they should use their active minds in social questions of the day. Many opinions were products of the fallow mind. They were not real opinions, but accidental prejudices. A little clear thought and study would clear up many of the problems of the day. The crowd-mind should also be studied; human beings were not logical, and it was therefore desirable for engineers to exercise their active logical minds in public affairs.

Dr. S. Z. DE FERRANTI pointed out that however great was knowledge, character was greater still. They could not all agree with the definition of a professional engineer, in which term he would also include the manufacturer and specification writer, and outside was a great class of engineers, all looking for mechanical means to assist people in their daily life and work. Such mechanisms, however, could not be usefully used except by engineers, and so it was fortunate that the number of mechanically-minded people was growing very rapidly, and it must be so if they were to "live." Engineers must often possess great persuasive powers in order to enlist the help of others in giving them the means to carry out their ideas, and in this sphere great knowledge of character was required. The great engineers of the past had also shown great perseverance and mental effort in persisting in face of very great difficulties. Engineers must "engineer" people in order to give them things which the engineers thought they should have. He hoped the paper would receive the consideration it deserved.

Mr. G. E. G. HINSHELWOOD (Student Member) said it was a new departure for a student to speak at a formal meeting of the Institution, but the privilege would be appreciated by all student members, and they would benefit thereby. The high ideals of the paper could be mostly absorbed by engineers, but how much better would it not be if the worker could do so. He favoured the more careful selection of young men who were to become engineers.

Mr. W. DAY explained that there was much in the paper that was applicable to most callings and professions. It therefore had no special significance for engineers. If selection were adopted, what would become of the very great unfit surplus? The gift of insight to character was very rare, and it would therefore not be easy to select the desirable people.

Mrs. M. S. MATTHEWS (Graduate Member) pleaded for more self-sacrifice in place of self-expression. Until they stepped further than "self," they would not realise the meaning of "life." Where a son was to follow his father, it would be wise to give the son the freedom of the works at a very early age, in order that the people he would later have to control might learn to respect him, and that he might appreciate them. She agreed with the need of the study of literature as a means of enlarging the mind.

Mr. B. O. ASON said there seemed to be an idea that engineers were not qualified for the larger posts of life. To correct that fallacy was the biggest fight they had before them. They must aim at controlling the country by engineers instead of lawyers.

Mr. P. DUNSHEATH said the paper was packed with horse-sense. Flexibility of ideas was very necessary, but it was rarely found. If a man refused to change his opinion, he had wasted the intervening year. There was too great a tendency nowadays to "smooth the path"—rather a dangerous suggestion, because it tended to destroy initiative. There was much to be said for choosing the right men to be made into engineers. During the war technical units had to draft into themselves men who were not engineers because such men often carried out the work better than so-called engineers. There were not many schoolmasters, however, who knew what sort of boy would make a good engineer; "he who knows, does; he who does not, teaches." Some day there might be consultants who would give advice to parents on such matters.

Mr. W. J. JOHN said that in technical education very much depended on the teachers. They should be engineers, and should be granted periodical leave, which should be spent in manufacturing works, so that the teachers themselves could be up-to-date in what they taught; there was a great gulf between a student and practice, which ought to be bridged by the teacher.

Mr. G. D HUPLPATT thought the paper of such value that it ought to have been sent to higher authorities. The author aimed a little too highly, and had weighted his paper a little too heavily on the "duty" side instead of the "due."

Mr. E. KILBURN SCOTT was of the opinion that they should capture the executive of the country. Engineers were too often exploited, and in many cases non-engineers were at the head of affairs. They should see that things were done, instead of merely talking about them. They wanted more engineers in Parliament.

Mr. T. CARTER briefly replied to the various points raised.

Correspondence.

Correspondents should forward their communications at the earliest possible moment. *No letter can be published unless we have the writer's name and address in our possession.*

Rural Electricity Supply.

Mr. Purse's letter in your issue of November 13th is deplorable. Because I did not advocate compulsory application of the I.E.E. (1924) Rules he hits at me through the cause of Rural Development. There is something involved far greater than my reputation as a debater, or Mr. Purse's position as a maker of rules. There is a general desire throughout the country to see the benefits of electricity made available in the country districts, where there is no public supply of power, heat, and light in any form. This cannot be done unless supply engineers recognise the difficulties and help each other to remove them.

The I.E.E. Rules are no special impediment to rural supply, and I have not suggested that they are. Mr. Walker introduced them as an example of over-regulation. While a consumer can demand and obtain connection—except in a few cities—provided the leakage does not exceed 1/10,000 of the maximum current, and the fittings are in a reasonable condition—the subject is not a live one outside those few city areas. If the I.E.E. would draw up a short statement of what is required to carry out a good commercial job at £1 a point in private houses and, say, 12s. in shops, there would be some chance that we would adopt it. As it is the Rules (1924) are only used for large installations, where cost is of secondary importance.

Mr. Bartholomew does not accuse me of side tracking; he complains that I compel him, again and again, to come back to the subject he would like to leave. He does not think I am losing—his anxiety to use every possible weapon, including simulated indignation and ridicule, shows that he, the official advocate of the Post Office, is fighting all out with his back to the wall.

When we go to law, we would like to sit on the bench and try our own cases *in camera*. The Post Office has manœuvred electricity undertakers into allowing this astounding state of things until now. The facts have been known for years and talked of in private, but engineers do not like to get up against public officials and Government Departments, and no-one has moved. The reception I have received at the hands of the Post Office fully justifies any man's hesitation, but under new conditions, which have developed sooner in Mid-Cheshire than in most areas, it became absolutely necessary to make a move and to point out the fact that we have a legal remedy provided in the Electricity Acts, *viz.*: a choice of arbitration or of appeal to the Electricity Commissioners. Mr. Bartholomew has very wisely ignored this in the hope that it will be forgotten. We are reluctant to do either, so we have availed ourselves of a further remedy, *viz.*: to appeal to the public, and that is why I have written to the ELECTRICAL REVIEW in the first instance, and have sent the photograph of the Middlewich monstrosity. This cost £250; when the expenditure of £30 on the part of the company and of a little energy on the part of the Post Office would have avoided a public eyesore and a scandalous waste of public money.

I expect your readers enjoy the comic relief which Mr. Bartholomew introduces into this otherwise serious discussion. If they look at the Middlewich monstrosity as depicted in your issue of November 6th, they cannot fail to notice the resemblance of the two towers to those of modern windmills. I am certainly tilting at the towers and must accept the *rôle* of Don Quixote to that extent. If Mr. Bartholomew continues to allot these various characters to me I shall soon be able to earn a fabulous salary "On the Halls" as a Protean Artiste.

The correspondence has brought out very clearly the unreasonable attitude of the Post Office. We have this specific case—typical of others—the Northwich-Middlewich-Winsford Junction or local line. It is important to keep it overhead because of the necessity to maintain certain qualities which are lost if it is put underground—yet 1¼ miles of it were put underground last year! The Post Office has met this *prima facie* case of error on its part by refusing to produce the calculations, which should exist, to justify this refusal to put a further 50 yards or so of it underground at our cost. I say that this attitude is unreasonable and contrary to our democratic form of Government; it is sheer autocracy.

We are responsible for public utility undertakings equal in public importance to the telephone service, and we decline to be fobbed off with vague talk such as this about maintenance of speech efficiency on local lines—when used occasionally for trunk calls. This qualitative talk could be used equally well to bolster up a refusal to put subscribers' connections underground if this happened to be a rule just now, because two of

these *always* form part of trunk circuits during subscribers' trunk calls.

Mr. Bartholomew says he is not used to his statements being questioned. I agree that service in the Post Office breeds that attitude—but it is very bad for him really. The important principle at stake is not which official is to blame if this particular line is on the verge of unintelligibility—which it must be if 50 yards more cannot be put underground—but whether the Post Office will supply to an interested party, information which any reasonable man would give to substantiate a disputed statement. To use Mr. Bartholomew's expression in a more polite form: Is the Post Office big enough to admit it has made a mistake in refusing technical information? As for inertia or laziness, it required far less energy to say "no" than to work out the effect of putting a section underground in a possibly doubtful case. So Mr. Bartholomew and the higher officials puff out a speech-efficiency smoke screen and melt away behind it. This is a form of inertia, or reluctance to take trouble, as I have said—or laziness as Mr. Bartholomew prefers to call it.

I do not blame them, I blame myself and the other supply engineers for our inertia in the past. It has been far easier for us to provide unnecessary gear, &c., in each case as it arose than to undertake the thankless task of persuading the Post Office to moderate its attitude, and it saved time. What was, however, merely a nuisance and an occasional expense under town conditions, where most of the Post Office lines are underground, has become a serious handicap in country work where Post Office lines are all overhead and where all ours must also be overhead because costs must be kept down; so we must get the matter put right *now*.

Mr. Bartholomew makes his case worse by setting out again the illogical actions of the Post Office. It is useless for him to spread out his hands and ask you to write me down an ass. He is, in fact, reminding those who know the Post Office "System" of many such cases in the Post Office service. In fact, unbelievable things go on continually. It has reminded me that at one time they persisted in altering our address from Northwich, Cheshire, on envelopes, to Norwich, Suffolk, delivering them to Norwich.

Mr. Purse suggests "subsidy" as a remedy. This might suit West Ham—but we provincials would rather avoid waste than ask the taxpayer to help us to over-capitalise our concerns. Up to the present we in Mid-Cheshire have avoided even a Treasury guarantee, which is a distinction in these days, and we hope to continue to be self-supporting.

W. Fennell.

Northwich, *November 17th*, 1925.

Salaries of Combustion Engineers.

It is very evident from the amount of salary offered in connection with recent vacancies for combustion engineers that the importance and value of such a man, if properly qualified, are not yet sufficiently realised in this country. As is now generally recognised, the boiler house has become the most important part of a power station from the profit-earning view, but the best efficiencies cannot be obtained unless boiler-house operation is under the close supervision of a specialist.

If shift engineers are to be encouraged to study this all-important branch of power plant engineering, some really attractive inducement must be held out in order to make the additional close study, both in the works and in spare time, worth while; to offer the same salary for a specialist or expert as is paid to the shift engineer with general training only, is not likely to encourage a man to go to the extra expenditure of time and money necessary.

The writer has had this complaint addressed to him on several occasions by men who have devoted considerable time and money to obtaining specialist knowledge, only to find that the salaries offered for the positions they desire are not such as to make application worth while.

Chas. F. Wade.

Sheffield, *November 20th*, 1925.

[We warmly endorse our correspondent's statement. The boiler-house is the Cinderella of electricity supply, but it is, as Mr. Wade points out, the place where efficient management is of the first importance. The combustion engineer must be adequately trained in chemistry and physics as well as in mechanical and electrical engineering, and ought also to be versed in psychology; he should therefore be one of the two most highly paid engineers after the chief on the staff of a large power station.—EDS. ELEC. REV.]

A Review Reviewed.

I am obliged to the reviewer of my book on the induction motor for pointing out some obvious defects, and I should be obliged if you would allow me to remark on a few of his observations. He says, in effect, that much of the utility of the book is due to the free use of the writings of Steinmetz, Walker, Kloss and Smith, and he accuses me of not paying due acknowledgment for Chapter I. I stated explicitly that I had made use of the works of Steinmetz, and, indeed, I should like to know what writer on the induction motor is not indebted to Steinmetz. With regard to Dr. Walker, although I am an admirer of his works, I am not conscious that I owe him the slightest indebtedness in this book, otherwise I should be grateful to acknowledge it. As regards Dr. Smith, I admit taking copies of torque-slip curves for Chapter I from his papers on "Design" due to the fact that I had little time to accomplish my task; otherwise I am not indebted to him for anything much that is not acknowledged. Your reviewer takes exception to the expression: "torque in synchronous watts." This term is universally used, and is not the invention of an American at all. He expresses surprise that so little use has been made of Mr. Creedy's invention and so much of the Hunt motor. The reason is that the Hunt motor has an extensive application and is a much more practical solution of the problem of speed control—although still imperfect—than Mr. Creedy's invention. While acknowledging the ingenuity of Mr. Creedy's device, I fail to see any great application for it.

The same remarks apply in lesser degree to the phase converter. One needs to preserve some right sense of proportion with regard to the space devoted to essentials and non-essentials. I am willing to submit to just criticism, but I notice that a vast amount of my own work—much of which is original, particularly on design—passes unnoticed, and credit is given to others. I think it is due to the purchasing public that the man who sits in judgment on the work of his fellows should have the courage of his convictions and sign his name to the review, so that it may know what weight to put on his criticism.

In this instance it would seem that the reviewer has not read the book at all, but has seized on a few trivial points which are relatively unimportant on which to place his carping criticism, and, further, he is guilty of making vague, general observations, which is what one would expect from one who makes a fetish of originality, but who probably never did anything original in his life.

H. Vickers, Ph.D., M.Eng.

Vancouver, Canada, *October 30th*, 1925.

The reviewer of Dr. Vickers's book regrets that his review was unsigned, but Dr. Vickers may rest assured that the only reason for the reviewer's name not appearing is because it is not the custom of the ELECTRICAL REVIEW to publish signed reviews. The review was written to enable intending purchasers to understand what they were likely to get for their money. If anything, the reviewer thinks that he was rather generous to the author, in view of some of the defects to which attention was drawn.

THE REVIEWER.

The Metering of Three-phase Power.

In the second paragraph of his letter commenting on Mr. Malcolm's interesting article, Mr. Jaques makes a grave charge against the supply undertakings when he states that inaccurate systems of metering are frequently employed, *many* of them being unfair to the consumer. Later in his letter he cites a case 15 per cent. against the supply undertaking. Can he give us any figures to substantiate his statement?

Referring to the problem of the correct meter for a three-phase four-wire supply, I would point out that the meter engineer has to decide which of the available apparatus on the market will give him the best results at a rational cost. Mr. Jaques will probably agree that three single-phase meters will do this. If it is necessary to measure the kW demand as well as the energy, then it will be necessary to use a three-phase four-wire meter, and whilst I agree that it is desirable to approximate as closely as possible to the three single-phase meters, one has to bear in mind that there are very few three-element meters on the market which are fitted with demand indicators and that interaction between the elements is an important source of error—in spite of what makers' pamphlets say—and these errors tend to be greater in a three-element meter than in a two-element meter. Mr. Jaques must give the meter engineer credit for knowing what he is about, and if he installs a two-element four-wire meter it is because he knows the circuit conditions and considers that he is getting the best possible all-round accuracy.

Whilst dealing with this subject may I be allowed to extend the scope of this discussion still further by pointing out that there is not a maximum-demand indicator on the market which comes within the limits of error specified in the B.E.S.A. Meter Specification; and I doubt whether any of them will come within the limits of error specified in the B.E.S.A. Instrument Specification.

As a meter engineer I am more concerned about inaccuracies in maximum-demand indicators than about two-*versus* three-element, three-phase, four-wire meters.

A Meter Superintendent.

November 17th, 1925.

I am glad that Mr. H. Hugh Jaques endorses my plea for accurate metering, and agree with him that the subject is one which does not always receive the attention and thought it merits. However, I think he will concede that supply engineers are gradually discovering the error of their ways as the errors of their metering systems come to light, and every day the "link with the consumer" is emerging from the ignominious position it once held to one of comparative and due importance.

I am sorry Mr. Jaques was disappointed in the scope of the article in question, but would point out that it was not intended to be a complete treatise on the subject, but merely a demonstration of the effect of various common abnormal conditions which can, and do, arise in everyday three-phase industrial power practice.

With regard to the metering of three-phase four-wire supplies, the use of the "three-element" type of meter is certainly preferable, but the cost is generally prohibitive, and is usually considered out of proportion to the benefits to be obtained. As the subject, however, is one on which opinion is still divided, investigation is indicated, and I propose to carry out experiments in this direction at an early date.

London, *November 17th*, 1925. **Geo. D. Malcolm.**

The Cost of House-Wiring.

In your issue of November 13th there is a letter by "Inquirer," entitled "The Cost of House-wiring." Writing from practical experience as a wireman, the average number of points complete per day for an eight-hour day for wireman and mate is four points a day. That is working in an occupied house, which means the shifting of furniture and raising of oil cloths, &c., and using slip tubing and cable.

November 16th, 1925. **Wireman.**

Buy All-British Goods!

I have been very much impressed lately with the admirable slogan that many firms are using, *viz.*:—"Buy British goods and thus support home industries," and it has made me wonder to what extent many who use this axiom act up to it in its entirety.

This calls for the further question what percentage of the component parts of an article can be purchased abroad and yet allow the complete article to be marketed as of British manufacture. It is much too large a field to be covered in a brief communication, but to illustrate the point we will take, say, a wireless intervalve transformer. Apart from the labour, this article consists of two main components: (1) the wire with which the coils are wound, and (2) the laminations which compose the iron circuit.

Now it does seem to me that a transformer wound with wire manufactured in America, or on the Continent, is not essentially a British transformer, although it is a "Transformer assembled in Britain." I believe members of the N.A.R.M. have very rigid regulations as to the supply of only British goods, and I am wondering if it is compulsory that these goods must be made of entirely British components. I certainly would not go so far as to say that the metals from which the components are made should be mined in this country, but I do think that we in Britain can handle their conversion.

Doubtless many manufacturers and traders purchase items from British wholesalers, in the genuine belief that they are getting entirely British-made articles, whereas it may be that the wholesaler himself is purchasing from a foreign source.

Prescot, *November 19th*, 1925. **James Nelson.**

British Industries Fair.

Your leader suggesting an Electrical Section is timely, and we would attend if the Electrical Section were in London. We have once exhibited at Birmingham Fair, but the Castle Bromwich site is very inconvenient as compared with the White City site for London. Besides, all foreign visitors go to London and only a portion go to Birmingham.

It would be much better to amalgamate and hold the joint exhibition in London.

Manchester, *November 23rd*, 1925. **J. D.**

The Licensing of Electric Wiremen.

Permit me, please, through your "Correspondence Columns," to express my gratitude that at least one nation (or should I say one Dominion) is endeavouring to protect the genuine electrical wireman.

I refer to the paragraph on p. 836 under the heading "Notes from New Zealand," which states that all electrical wiremen will have to pass a test; I think (and I am sure a good many contractors do) that something of the kind ought to be done in England, for there are numerous men to-day who cannot carry out the work necessary to comply with the rules of the I.E.E. The Rules, I think, are not too severe, considering the danger that can be caused by unqualified men, who cannot claim the union rate of wages because they are incompetent; but who, on the other hand, are employed by some contractors who are cheap-jacks, and would have to raise the price per point should they employ genuine electrical wiremen. I think more than myself will endorse the idea of New Zealand.

Stocksteads, *November 23rd*, 1925. **Joshua Rose.**

Legal.

Bartholomew v. Electrical Distribution of Yorkshire, Ltd.

ADJOURNED from October, the hearing was concluded at Rotherham County Court last week of a claim for £35 damages by Thomas Bartholomew, a carting contractor, of Rotherham, against the Electrical Distribution of Yorkshire, Ltd. It was stated that the defendants, having laid a cable, had left a road in a dangerous condition. Plaintiff said that when he was driving his 'bus over the trench the jolt was sufficient to break his rear axle.

His Honour Judge LIAS gave judgment for the plaintiff for the full amount.

Metropolitan Water Board v. North Metropolitan E.P.S. Co., Ltd.

MR. JUSTICE ROMER, in the Chancery Division on November 19th, had before him a summons taken out by the Metropolitan Water Board asking for a declaration that upon the true construction of the Electricity Supply Act, 1919, the Minister of Transport had no power to make an order authorising the North Metropolitan Electric Power Supply Co., Ltd., to abstract any water from the King George reservoir at Chingford, the property of the Board.

Mr. F. H. MAUGHAM, K.C., for the plaintiffs, said the point was whether a reservoir of a body of water was a "source" or not within the meaning of the Act, in which power was given to electrical undertakings to take water from "any river, stream, canal, inland navigation, or other source." It was a matter of great importance to the Board because if water could be taken from a reservoir it was difficult to see what could prevent its being taken from a main. If it had been intended by the section to give the word "source" as wide a meaning as the SolicitorGeneral must contend for, was it not plain that there would have been some provision for the protection of the water authorities? Not a single gallon of water could be taken from a dock without the consent of the owners, and the Crown did not intend to authorise the Minister to make an order which might deprive the Board of millions of gallons of water every day. The Board was at the greatest stress at some parts of the year to supply the needs of the public, and the smallest variation in the temperature of the water returned to the reservoir would have the most serious effect on the carrying out of its statutory duties.

The SOLICITOR-GENERAL said it was true that the Minister of Transport had the power to make such an order as was in contemplation, but his Lordship must take it that he had not arrived at any considered opinion as to whether the order was likely or ought to be made. He first of all wished to hear the objections which might be raised to the proposal to make such an order against the Board, and these would all be laid before the Minister at the inquiry to be held. But he wanted his Lordship's guidance and decision to govern, not merely that case, but others that might arise in different parts of the country. There was no appeal from the decision of the Minister, but he was at liberty to impose what conditions he liked as to the utilisation and return of water. This case turned upon the question of the interpretation of a particular word and not upon the merits of this particular proposal. The Minister had power to make an order, but it was also within his power to say: "I will make the order if you will do such things as are reasonable to provide compensation to the person whose water you are taking." He (Counsel) contended that the word "source" covered a natural sheet of water such as a lake as well as a body of water partly natural and partly artificial.

His LORDSHIP said he would take time to consider his judgment.

Marconiphone Co., Ltd., v. British Portable Radio, Ltd.

THE petition by the Marconiphone Co., Ltd., for an order for the compulsory liquidation of British Portable Radio, Ltd., was dismissed by Mr. Justice Romer in the Companies' Winding Up Court on November 17th.

Counsel for the petitioners said that the respondent company had paid them out and there were two other creditors whose debts had also been paid and the costs provided for.

Automatic Telephone Patents Extended.

IN the Chancery Division on November 18th, Mr. Justice Tomlin heard the petition of the Automatic Telephone Co., Ltd., Liverpool, for the extension of the period of six patents relating to improvements in telephone systems, on the ground that the applicants had been unable to work the patents during the war.

Mr. COURTENAY TERRELL, for the applicants, said that the patents which would in the ordinary course expire in January next, related to automatic telephones. The company was incorporated with a large capital to acquire patents from the Automatic Telephone & Electric Co., of Chicago. He asked for an extension of six years—an unusual extension—because the invention required an enormous amount of plant, and immense experience, and was one which would be chiefly used by the Government.

His LORDSHIP granted an extension of five years.

Damages Against Accrington Corporation.

AT the Accrington County Court, on November 20th, Messrs. H. Nuttall & Co., brewers, were awarded £11 12s. 6d. damages in respect of injury to a lorry by one of the Accrington Corporation's tramcars. A counter-claim by the Corporation for £106 for damage to its tramcar failed.

London Electric Supply Corporation Summoned.

AT the Greenwich Police Court, on November 23rd, Mr. Dummett continued the hearing of a summons against the London Electric Supply Corporation, Ltd., for failing adequately to protect an e.h.p. transformer, in consequence of which an employé was killed.

It was stated in evidence that an earthing device failed, and the employé, named Harwood, was sent to rectify it. He was found later dead inside the transformer cage with burns

on two fingers. The pressure on the transformer was said to be 10,000 V, but Mr. Fillbery, defending, said that if that had been the case Harwood would have been burned up.

Mr. SCOTT RAM, Electrical Inspector of Factories, said that the terminals might have been enclosed to render them safe against accidental contact.

The company's defence was that the enclosing of the transformer in a cage was sufficient protection.

Mr. Dummett reserved judgment.

De Laval, Chadburn Co., Ltd., v. Empson Centrifugals, Ltd.

IN the Chancery Division on November 19th, Mr. Justice Astbury had before him a summons taken out by the defendants in the action of De Laval Chadburn Company, Ltd., against Empson Centrifugals, Ltd., asking to strike out the plaintiffs' statement of claim on the ground that it disclosed no cause of action, or, alternatively, to strike out certain passages from it as tending to prejudice the fair trial of the action and as being embarrassing and irrelevant.

Mr. Macaskie appeared for the defendants, the applicants, and Mr. Warwick Draper for the plaintiffs, the respondents to the summons.

His LORDSHIP said the statement of claim alleged that the plaintiff company was incorporated in 1923 for the purpose of carrying on the business of designers, manufacturers and merchants of and dealers in centrifugal and other separators for all or any purposes and was the selling agent and concessionaire in the United Kingdom for the well-known and successful centrifugal oil purifier machine known and described as the De Laval centrifugal oil purifier. In September, 1923, the defendant company was formed by A. W. Empson for the purpose of manufacturing and dealing in centrifugal oil purifiers. Mr. Empson is managing director of the defendant company. On December 5th, 1924, there appeared in the ELECTRICAL REVIEW an article by H. D. Jukes, who (his Lordship was told) was an independent investigator, and who in his article made a report recording the results of a series of tests made by him with the oil purifier of the plaintiff company. The report (said the judge) was then set out at considerable length and it detailed certain results obtained by Mr. Jukes. Whether the plaintiffs could obtain better results from their machines or whether Mr. Jukes was right or wrong in what he said did not appear. The statement of claim went on:—On February 6th and 20th, 1925, the defendant company inserted in the same REVIEW an advertisement of their goods and the statements complained of in the advertisement were then set out in full. The first was "Insulating oil treated in the Empson centrifugal oil purifier (that is the defendants') has been exposed to the atmosphere for three weeks and still had a B.D.V. of 56 K.V." The next sentence was: "Compare this with a report recently published concerning another method of centrifugal purification which showed that while the oil left the machine with a B.D.V. of over 50,000 volts it fell to 38,000 volts after standing for about 48 hours in a closed tank." That was a reference and an accurate reference to part of Mr. Jukes's report. The next sentence complained of was: "The efficiency of a centrifugal oil purifier cannot therefore be judged solely on rate of flow and B.D.V. straight from the machine." That was the whole cause of action alleged—the insertion of this advertisement which made a certain statement as to the efficiency of the defendants' machine and compared it with the report made not by the plaintiff company at all but by an independent writer in the ELECTRICAL REVIEW. The cause of action alleged by the plaintiffs was then attempted to be stated: "By the said advertisement the defendant company referred and were understood by the readers of the same to refer to the said report of the said H. D. Jukes and the said oil purifier of the plaintiff company and meant and were understood by the said readers to mean that the plaintiff company's oil purifier was inferior and ineffective. The said advertisement of the defendant company was an inaccurate and unfair paraphrase of or allusion to the said report on the plaintiff company's oil purifier and defamatory of the plaintiff company in their business. By the said advertisement which was in fact read by many persons whose names are unknown to the plaintiff company, the defendant company has falsely and maliciously published a libel upon the plaintiff company in their business in oil purifiers. Notwithstanding a protest sent to the defendant company by the plaintiff company's solicitors on April 7th, 1925, the defendant company threaten and intend to continue the publication of the advertisement complained of or other advertisements or words containing similar unfair and defamatory allegations. By reason of the premises the plaintiff company have been injured in their credit and reputation and have suffered damage." Then an injunction was asked for, to restrain the defendant company from printing, publishing, issuing and distributing the statement contained in the advertisement or any similar statement referring directly or indirectly in any unfair or defamatory manner to the plaintiff company's oil purifiers to the prejudice of the plaintiff company; and damages and costs were asked for.

This statement of claim contained two alleged causes of action, an alleged slander of the plaintiffs' goods and an alleged libel on the plaintiff company. So far as it alleged slander he was of opinion that it disclosed no cause of action and ought to be struck out. As to the alleged libel there was nothing in the defendants' advertisement which was any libel at all. It was the commonest thing in the world for one trader to advertise that his goods were better or more efficient than any other and the Courts had said over and over again that that disclosed no cause of action. Mr. Draper apparently feeling the force of these criticisms, had attempted to suggest that what the plaintiff company really wanted was to obtain an injunction against some sort of unfair competition, but the injunction that was asked for was solely confined to the repetition of the advertisement complained of and similar advertisements, and it was quite impossible to read that as asking for relief otherwise than such as could be based upon allegations in the statement of claim. The statement of claim disclosed no cause of action and it must be struck out. The costs would be the defendants' in any event.

Mr. Draper asked for and obtained leave to appeal.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1924.

2,051. "Condensers for wireless telegraphy and telephony." J. A. Williams. October 25th, 1924. (241,806.)

10,530. "Electrically-operated indicating apparatus for vehicles." J. McCreath. April 29th, 1924. (Cognate applications Nos. 22,630/24 and 27,070/24.) (241,964.)

15,849. "Variable electric condensers." J. H. Watkins, E. B. Watkins, and Dubilier Condenser Co., Ltd. July 1st, 1924. (241,971.)

15,542. "Telephone transmission lines." A. Rosen. July 2nd, 1924. (241,972.)

17,788. "Publicity telegraphs and advertising devices." H. K. Harris. July 24th, 1924. (241,978.)

17,909. "Manufacture of coated metallic conductors." General Electric Co., Ltd., and C. J. Smithells. July 28th, 1924. (241,984.)

18 038. "Electric traction systems employing storage batteries." E. W. Muller. September 26th, 1923. (222,448.)

18,123. "Electric distribution systems." V. F. Spigai. July 29th, 1924. (Convention date not granted.) (219,984.)

18,216. "Secret signalling systems." Western Electric Co., Ltd. July 31st, 1923. (219,987.)

18,249. "Variable electric condensers." R. Woods. July 30th, 1924. (241,992.)

18,252. "Composition or mixture for use as an insulating material in electrical work and for other purposes." C. Pickstone. July 31st, 1924. (Cognate applications 1,688/25 and 1,689/25.) (241,993.)

18 359. "Manufacture of highly refractory bodies." Naamlooze Vennootschap Philips Gloeilampenfabrieken. August 9th, 1923. (220,301.)

18,402. "Electric motors." W. C. Fairweather (Underwood Typewriter Co.) August 1st, 1924. (241,994.)

18,411. "Filaments for thermionic valves and for electron-emitting devices." S. R. Mullard and Mullard Radio Valve Co., Ltd. August 1st, 1924. (241,996.)

18,785. "Electric relays for automatic voltage regulation." A. H. Railing and A. E. Angold. August 5th, 1924. (242,002.)

18,723. "Sound directing or amplifying horns and like acoustic apparatus." E. A. Graham. August 6th, 1924. (Addition to 217,675.) (242,004.)

18,745. "Sparking plugs." F. Lilienthal. August 6th, 1923. (220,315.)

18,827. "Electric telegraphy." H. V. Higgitt and Eastern Telegraph Co., Ltd. August 7th, 1924. (242,006.)

18,903. "Electromechanically operated electric switch devices." English Electric Co., Ltd., and T. Zweigbergk. August 8th, 1924. (242,008.)

19,011. "Variable electric condensers." W. F. Dunn and E. A. Tansley. August 12th, 1924. (242,010.)

19,425. "Electrical signalling systems, particularly wireless receiving systems." G. W. Hale and R. Lyle. August 16th, 1924. (Cognate application 20,603/24.) (Addition to 223,630.) (242,013.)

19,465. "Asynchronous dynamo-electric machines." Neufeldt and Kuhnke. August 17th, 1923. (220,652.)

21,171. "Radio condenser." F. B. Dehn (Mohawk Electric Corporation). September 8th, 1924. (242,023.)

21,535. "Antenna systems for receiving wireless signals." Telefunken Ges. fur Drahtlose Telegraphie. September 11th, 1923. (221,825.)

22,066. "Telephone receivers." C. A. M. Buckley and H. S. Buckley. September 18th, 1924. (242,035.)

22,562. "Electromagnetic sound reproducers." C. E. Brigham. September 24th, 1924. (242,041.)

23,240. "Automatic telephone systems and the like." Siemens Bros. and Co., Ltd., and W. Patterson. October 1st, 1924. (242,048.)

24,405. "Holders or supports for thermionic valves or electron discharge tubes." W. S. Sholl. October 14th, 1924. (242,057.)

25,908. "Magnetic separators." S. D. White and J. B. Kramer. October 30th, 1924. (242,077.)

30,175. "Method of and device for signalling by means of electric waves." E. Bräuer. December 14th, 1923. (226,243.)

31,021. "Dynamo-electric machinery." K. Nobuhara. December 24th, 1924. (242,108.)

1925.

372. "Electric starting devices for engines." R. W. Barker (Anti-Stall, Inc.). January 6th, 1925. (242,115.)

1,366. "Sound directing or amplifying horns and similar acoustic apparatus." G. Campbell and E. S. Dumont. January 16th, 1925. (242 122.)

4,959. "Electric discharge devices." Westinghouse Lamp Co. February 23rd, 1924. (229,704.)

5,789. "Electric switch." W. Fairweather (Singer Manufacturing Co.). March 3rd, 1925. (242,140.)

6,332. "Construction of inductance coils." Western Electric Co., Ltd. (Western Electric Co. Inc.). March 9th, 1925. (242,143.)

6,932. "Electrical power transmission systems." Dr. B. Zavada. March 14th, 1925. (242,145.)

7,287. "Bulkhead and like lamps." Heyes & Co., Ltd., and W. A. Heyes. March 18th, 1925. (242,146.)

8,668. "Electric terminals." F. V. Breemdem. April 1st, 1925. (Cognate application 13,824/25.) (242,156.)

8,937. "Electric condensers." Dubilier Condenser Co., Ltd. April 4th, 1924. (231,883.)

9,099. "Electrical arrangement for working blast heaters for blast furnaces." Zimmermann & Jansen Ges., and H. Rappold. April 6th, 1925. (Addition to 30,571/24.) (242,161.)

9 267. "Sound amplifying and diffusing apparatus." M. T. P. Griffiths. April 7th, 1925. (242,164.)

9,309. "Supports for secondary electric batteries." Chloride Electrical Storage Co. Ltd. (Electric Storage Battery Co.). April 8th, 1925. (242,166.)

12,370. "Sheathing for single-core alternating current cables." Felten and Guilleame Carlswerk Akt. Ges. May 12th, 1924. (233,736.)

13,641. "Arrangements for driving auxiliary machines for electrical generators." Akt. Ges. Brown, Boveri et Cie. May 24th, 1924. (234,523.)

13 747. "Control of dynamo-electric machines." British Thomson-Houston Co., Ltd. May 27th, 1924. (234,812.)